HEALTH ASPECTS OF PESTICIDES

abstract bulletin

April 1973 - Vol. 6, No. 4

Abstracts 73-0754-1010

HAPAB 06(04) 165-224

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS

TECHNICAL SERVICES DIVISION
4770 Buford Highway, Bldg. 29
Chamblee, Georgia 30341

HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Technical Services Division of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Vol. 6 April 1973 No. 4

Page

General 165

Monitoring and Residues 170

Epidemiology, Prevention and Treatment 184

Toxicology and Pharmacology 192

Analysis 216

73-0754. Richou-Bac, L.; Cumont, G.; Mollet, M. F.; Pantaleon, J. (Lab. Central de Rech. Vet., Maisons-Alfort, France). **Contamination de l'environnement et de la faune par les polluants industriels: les diphenyles polychlores (P.C.B.). [Contamination of the environment and of the fauna with polychlorinated biphenyls (PCBs).]** *Bull. Acad. Vet. Fr. 45(6): 293-303; 1972.* (17 references) (French)

General environmental problems involved with PCBs, analytical methods for the determination of PCBs in food products, measurements of PCB residues in fish, and toxicological aspects of PCBs are described. PCB residues have been determined in several animal food products since 1966. An investigation of PCB residues in trout and other fresh-water fishes affected by mycosis revealed PCBs in 39% of the specimens. The frequency of PCB contamination in game appears to be lower than in fish. While the biochemical action mechanisms, unknown in humans, are similar in fish and birds, the lesions observed are different. PCB compounds with not more than 3-4 chlorine atoms metabolize fairly rapidly in birds; compounds with many chlorine atoms are responsible for inducing the hepatic microsomal enzyme system and increasing the microsomal protein and the cytochrome P-450 levels. PCBs may affect reproduction in fish and birds and have strong embryotoxic effects in the second generation of birds. An electron capture gas chromatographic method using an injection temperature of 250°C, a column temperature of 195°C, and a detector temperature of 270°C has been developed for PCB determination.

73-0755. Ruud, L. (Author address not given). **Non-chemical pest control.** *Compost Sci. 13(5): 14-16; 1972.*

Knowledge of ecological relationships and life cycles is more important in non-chemical pest control than in pesticide control situations. Proper timing of planting can eliminate most of the damage caused by insects which only become pests at certain times of the year. Knowing the limitations of predatory insects, botanical insecticides, or bacterial insecticides avoids useless applications. Pheromones (sex attractants) are particularly useful in plotting flights of pests and timing various control methods.

73-0756. Butler, W. A. (Environ. Defense Fund, Washington, DC 20036). **Law and science team up to preserve environmental quality.** *Environ. Sci. Technol. 7(1): 30-35; 1973.*

With a permanent staff of five scientists, seven lawyers, and two economists and numerous volunteers the Environmental Defense Fund (EDF) was founded to oppose the use of DDT in mosquito control on Long Island and has since been involved in a number of environmental legal cases across the country. EDF has petitioned the Environmental Protection Agency for the cancellation and suspension of aldrin and dieldrin. Although hearings have not yet taken place, manufacturers of these compounds voluntarily stopped their most hazardous uses. Other court and administrative cases have involved mirex and 2,4,5-T. Scientific petitions have been submitted to the U.S. Forest Service calling for increased research emphasis on integrated and biological control of gypsy moths.

73-0757. Section of Pesticide Residue (Agr. Chem. Inspection Station, Kodaira, Tokyo, Japan). **Tolerances for residues and directions for safe use of agricultural chemicals in Japan (4).** *Jap. Pestic. Inform. 13: 19-25; 1972.*

The basic provisions are given for the addition to the Japanese Agricultural Chemicals Regulation Law in 1971 concerning directions for the safe use of agricultural chemicals. Listed in tabular form are the pesticide products, crops on which they can be used, acceptable formulations, methods of application, number of applications, and waiting periods before harvest. Use of DDT, BHC, and parathion on crops is prohibited. Directions for safe use of DDT, BHC, dieldrin, endrin, parathion, EPN, arsenic, lead, malathion, diazinon, and carbaryl with respect to the prevention of harm to aquatic animals is included; danger of drifting or draining into rivers, lakes, marshes, seas, and nurseries prohibits their application. Sparing use and small coverage are recommended. Waste water and used containers should be buried in an area where pollution of underground water is impossible.

73-0758. Tomaru, K. (Hatano Tobacco Exp. Station, Japan Monopoly Corporation, Japan). **Pesticides to control diseases and insect pests of tobacco.** *Jap. Pestic. Inform. 13: 27-31; 1972.*

Japanese intensive agriculture and climate require the use of pesticides in tobacco cultivation to sustain production. As with other crops, residue and toxicity problems occur, especially since tobacco is inhaled rather than ingested. In addition to toxicity considerations, flavor and odor of pesticide-treated leaves must be considered. Applications of dust preparations, liquid preparations, and antibiotics 20, 10, and 3 days before harvest, respectively, were prohibited because of their effects on flavor and odor. After completion of a residue survey, standards of safe use will be established.

73-0759. Fukuoka Prefectural Government Office (Fukuoka, Japan). **[Chapter 4: Environmental Pollution by Pesticides.]** *In: Kankyo Hakusho–Showa 47-Nendo (White Paper on the Environment), 1972, pp. 248-252.* (Japanese)

The 1969 inspections of the Ministry of Health and Welfare revealed that milks from various parts of Japan were polluted by BHC and those from western

Japan contained particularly high amounts of β-BHC residue. The highest prefectural average was 1.3 ppm. More stringent regulations on BHC and other organochlorines resulted, and after June 1971, the maximum allowable residue standard for β-BHC was reduced to 0.2 ppm. The Pesticide Control Law of January 1971 was enforced as of April 1, and the use and sales of DDT were prohibited; BHC products were to be used against tree insects only. Later, however, the registration of BHC was canceled altogether as of December 30, and its use and sales entirely prohibited. The use and sales of aldrin, dieldrin, and endrin were also restricted. The use of parathion, TEPP, and schradan as pesticides was prohibited as of June 1, 1971. Residue standards were set for DDT, BHC, aldrin and dieldrin, endrin, parathion, EPN, arsenic, lead, diazinon, and malathion in 25 kinds of produce. To prevent milk pollution Fukuoka prefecture has also prohibited the use of BHC and DDT on cattle sheds and other related structures, as well as the use of straw sprayed with BHC; systems for securing and distributing clean straw and inspection of milk and straw were established. As a result, the average BHC residue in milk as of May 1972 was reduced to 0.030 ppm.

73-0760. Fisken, A. G. (Shellstar Ltd., Fertilizer Plant, Ince Marshes, Chester CH2 4LB, England). **Pesticides and the environment.** *Med. Sci. Law 12(2): 104-108; 1972.* (1 reference)

It is well known that pesticides are necessary to our way of life and can be used safely when parties involved cooperate. In Britain the voluntary Pesticides Safety Precautions Scheme, developed among government departments, the British Agrochemical Association, and the British Pest Control Association, involves compliance with the following procedures: notification to the Ministry of Agriculture, Fisheries, and Food before introduction of a new product; disclosure to the Ministry of all information needed for recommending precautionary measures; withholding of a new product until agreement has been reached on these measures; labeling with precautionary measures; and withdrawal of the product if recommended by the Ministry's Advisory Committee on Pesticides and Toxic Chemicals. The scheme works in practice as if it were mandatory and cooperation has been good. Several new methods of application and other improvements have been developed as a result.

73-0761. Anonymous. **Persistent pesticides and PCBs in the environment.** *Nature 240(5380): 319-320; 1972.*

Three principal questions have been raised about organochlorine pesticide and polychlorinated biphenyl (PCB) residues in the environment. The first concerns the accuracy of identification, now generally regarded as adequate, except for extremely low levels in field samples. The second is the question of biological activity at very low levels. Persistent organochlorine insecticides and PCBs can have measurable effects in the laboratory at levels considerably below the lethal dose, but the significance of such findings in relation to field conditions is still disputed. The third question is whether these compounds significantly affect populations not deliberately or directly exposed to them. Field tests cannot always determine whether pesticides affect many populations and species and force biologists to reach conclusions by circumstantial evidence. Although circumstantial evidence often discredits a conclusion, skepticism can be reduced by considering all relevant information and other hypotheses. The reduction of the use of organochlorine pesticides in view of possible eggshell thinning is based on a causal hypothesis and confirmed by reversal of reproductive failure occurring in some areas.

73-0762. Prall, R. C. (Eastern Pennsylvania Psychiatric Inst., Henry Ave., Philadelphia, PA). **The physician's role in prevention of mental and emotional disorders.** *Pa. Med. 75: 71-78; 1972.* (40 references)

A discussion of teratogenic substances and other influences causing organic damage in infants includes environmental toxins such as herbicides, insecticides, and heavy metals. The spraying of 27 lb/A of 2,4-D and 2,4,5-T in Vietnam could lead, after one inch of rain, to concentrations in drinking water that would expose a pregnant woman drinking one liter of water/day to a dosage of 50 mg/day, a level not far below the minimum teratogenic dose in mice and rats. PCNB and other pesticides which produce malformations in animals need further study. Increased concentrations of DDT and endrin in the food chain have caused massive fish kills and near extermination of certain bird species. There is wide-spread evidence of DDT accumulation in human tissue. Lead from paint and gasoline and arsenic from farming may also be harmful. Public education and efforts to obtain stronger legislation and enforcement on environmental matters are needed to reduce the danger to infants.

73-0763. Yoshiike, A. (Environment Agency, Water Quality Bureau, Japan). **[Agricultural Chemicals Regulation Act in Japan.]** *PPM 3(11): 69-74; 1972.* (Japanese)

Since residues of agricultural chemicals affect people's health when in foods and pollute the soil and water, the Agricultural Chemicals Regulation Act of Japan was markedly amended. The existing ACR Act was guided by the establishment of the Environment Agency. Provisions include tighter registration procedures; cancellation of already registered agricultural chemicals, if necessary; restriction or prohibition of sales of registered agricultural chemicals, if necessary; restriction of application of registered chemicals which persist on/in crops and soil and pollute water; establishment of

safety standards; inspection of shops and farms. Experimental data on mammalian chronic toxicity and persistency on/in crops and in soil of the candidate chemicals must be submitted with the application for registration. Registration may be suspended if it is feared that the use of the chemicals causes pollution of crops, soils, and water or damages humans and useful animals.

73-0764. Anonymous. **The Utah Pesticide Control Act.** *Proceedings of the Twenty-Fourth Annual Meeting of the Utah Mosquito Abatement Association, 1971, pp. 25-28.*

The Utah Pesticide Control Act provides for a pesticide committee appointed by the governor and comprising representatives of state agencies involved in pesticide use. The Commissioner of Agriculture must have approval from the committee to promulgate regulations pertaining to the sale, use, and disposal of pesticides. A public hearing must be held before any rule or regulation is adopted, changed, or rescinded if the Commissioner considers that reasonable grounds have been furnished by the party wishing to take action; all final decisions of the Commissioner are subject to judicial review. Use or disposal of any pesticide contrary to label directions or regulations of the Commissioner judicial review. Use and disposal of any pesticide contrary provisions of the act are guilty of a misdemeanor.

73-0765. Joly, P. (Universite de Strasbourg, Strasbourg, France). **Les hormones des insectes. [Insect hormones.]** *Recherche 3(21): 213-220; 1972.* (5 references) (French)

Studies on the hormonal control of physiological processes in insects are reviewed with special attention to the juvenile hormones as possible insecticides. The juvenile hormones of insects release the ovarian development and maintain the larval status and can halt all ontogenesis when applied in increased doses. The biodegradable juvenile hormones, though expensive, are ideal, especially since the insects affected are unable to develop resistance or immunity to them. The synthesis of less expensive analogs of juvenile hormones is being studied.

73-0766. Lecarre, A. (Author address not given). **Une nouvelle generation d'insecticides. [A new generation of insecticides.]** *Recherche 3(21): 221; 1972.* (French)

New preparations and methods and possible substitutes for DDT, PCB, and other persistent products in insect control are reviewed. Juvenile hormones, although effective, are expensive and fairly unstable. The development of resistance against juvenile hormones in the insects affected is not probable. The use of the natural enemies of insects and of pheromones for the subsequent sterilization of the males are promising biological insect control methods.

73-0767. Stenersen, J. (Norwegian Plant Protection Inst., 1432 Vollebekk, Norway). **Pesticides for plant protection in Norway: legislation, use, and residues.** *Residue Rev. 42: 91-102; 1972.* (13 references)

The marginal climate for insect pests in Norway aids in reducing insecticide use; however, restrictive pesticide legislation has been enacted. The basic law is the Plant Protection Chemicals Act of 1963, administered by the Ministry of Agriculture and stating that official approval is required before a pesticide can be used. Further details were provided in regulations and amendments of 1964 and 1970. There are about 100 active ingredients in 230 formulations on the market. Herbicides are predominant. Approved insecticides include 16 organophosphates, lindane, and DDT (for control of pine weevils on conifers only). Carbamates are not generally used, mainly because of their high toxicity to beneficial invertebrates. Methoxyethylmercuric fungicides are used on about half of the seed grain in Norway. About 80% of the area where cereal is grown is sprayed with ioxynil, phenoxy acids, and nitrophenols; 2,4,5-T is extensively used to control forest undergrowth, weeds on rights-of-way, and pasture herbage. There is no regular residue monitoring program for domestic or imported foods (the latter account for 60% of the calories consumed). Isolated residue studies have been performed, and residue levels found are compared with international standards. Organochlorine pesticide residues were found in birds, soil, fish, and human tissues.

73-0768. Saha, J. G. (Canada Agr. Res. Sta., University Campus, Saskatoon, Saskatchewan, Canada). **Significance of mercury in the environment.** *Residue Rev. 42: 103-163; 1972.* (228 references)

Both nature and man contribute to the contamination of the environment with mercury. The natural circulation of mercury on earth disperses it through rock, soil, water, the atmosphere, and the biosphere. All food contains traces of natural mercury, ranging from low levels of 0.02 ppm or less in vegetables and fruits to 1 ppm or more in freshwater fish. Human activities have considerably altered the natural distribution of mercury. The agricultural use of mercury sometimes slightly increases the mercury content of crops and in other cases has no effect. There has been no significant increase in the mercury content of foodstuffs during the past 30 years. The daily intake of mercury through food averages less than 20 μg per person. Since mercurial seed dressings are used at the rate of 1 g of mercury per acre or less, the same order of magnitude as the quantity received by the soil through precipitation, the use of mercurial seed dressings does not increase the mercury content of soil, water, or fish. Treated grain eaten by birds may increase mercury levels in these birds or their predators. Seed grain improperly used as food or animal feed has resulted in poisoning of humans in Iraq, Guatemala, Pakistan, and New Mexico.

73-0769. Wissa, S. (Montecatini Edison Liaison Office, Cairo Egypt). **Pesticide regulation in Egypt.** *Residue Rev. 42: 165-172; 1972.*

After providing some data on pesticide importation and production in Egypt, a brief account is given on the evolution of pesticide regulation from 1921 to 1967. An outline is finally reported of the main provisions of Act 509 of 1954 (and subsequent amendments of 1962) and of the latest law, the Republican Act 50 of 13 June 1967, regarding the composition and function of the Pesticides Board and Research Committee, the restriction of import to state companies, the toxicological classification of pesticides, the information to be submitted in order to obtain registration, and the rules covering packaging, marketing, sales, surveillance, and inspection. (Author abstract by permission)

73-0770. Manescu, S. (Chair of Gen. and Commun Hyg., Med.-Pharm. Inst., Bucharest, Rumania). **Value of the manometric method in study of the action potential of chemical micropoluants [*sic*] upon the autopurifying flora in water.** *Rom. Med. Rev. 16(1): 21-30; 1972.*

English translation; for an abstract of the original Rumanian article, *Igiena* 20(5): 275-286; 1971, see Abstract no. 72-2505.

73-0771. Moerzer Bruyns, M. F. (Nature Conservation Dept., Agr. Univ., Wageningen, The Netherlands). **Nature preservation and chemical pollution. Historical survey.** *TNO-Nieuws 27(10): 528-531; 1972.* (8 references)

Hazards of pesticide use for wildlife were recognized by 1950 in the Netherlands and research was initiated in this area in 1954. In 1965 TNO established a committee to coordinate this research effort. The Working Group "Birds and Mammals," the most important of the nature preservation groups into which TNO divided its activities, primarily conducted systematic research on species at the end of the food chain with special emphasis on persistent pesticides. Herbivores and other species which might be useful as indicators were also studied. A long-term field ecological study of bird and mammal populations in several habitats in The Netherlands was set up. A central documentation system was established for all information concerning effects due to the application of pesticides. The group also participated in the OEDC program of monitoring studies. The value of these accomplishments is evident as is the necessity of expanding activities in the near future.

73-0772. Cote, R. P. (Environ. Protect. Serv., Dept. of the Environ., Halifax, Nova Scotia, Canada). **What's known about pentachlorophenols.** *Water Pollut. Contr. 110(12): 35-37; 1972.*

A review of the scientific information available on PCP suggests that it does not present a problem of environmental contamination of the magnitude of DDT, but hat it can have a significant impact on a localized area where it is continuously added to the environment. PCP is degraded by sunlight when in solution, and sodium PCP is decomposed directly by sunlight, the rate being dependent on temperature and, with soils, soil type. Degradation in water or accumulation in tissue can be monitored using a gas chromatographic technique. LD50s for PCP in mammals range from 39 mg/kg to 350 mg/kg depending on the vehicle used. Symptoms of poisoning in man have been observed at blood levels of 40 to 80 ppm. The compound stresses the circulatory and respiratory systems. Toxicity in aquatic organisms has been studied in detail, and Na PCP affected growth rates, rates of yolk catabolism and oxygen consumption, and efficiency of yolk utilization. A concentration of 400 ppb was sufficient to interfere with the degradation activities of sludge bacteria.

73-0773. Tell, E. (Author address not given). **Schweiz Pesticide. [Rulings concerning pesticides in Switzerland.]** *Z. Lebensm. Unters. Forsch. 148(5): 195-196; 1972.* (2 references) (German)

Rulings adopted in Switzerland in March 1969 concerning the use of certain pesticides are presented. Maximum allowable pesticide residue concentrations in cereals, vegetable products, meat, and milk products are listed. The use of aldrin, dieldrin, endrin, DDT, DDE, lindane, chlordane, heptachlor, and other persistent organochlorine pesticides in farms, forests, and dairies is prohibited.

73-0774. Blaszyk, P. (Pflanzenschutzamt, Oldenburg, Germany). **Naturschutz geht alle an! [Environmental protection is everybody's business!]** *Gesunde Pflanz. 24(1): 1-5; 1972.* (German)

The impact of pesticides on the environment, especially on the flora and fauna, is outlined. Pesticides are still necessary to increase crops and curb epidemics, but readily degraded, low-toxicity preparations are needed to minimize harmful effects on the environment. Highly persistent organochlorine pesticides, used in small quantities in Germany, are becoming increasingly popular in developing nations. The use of herbicides should be limited mostly to farm lands to avoid major changes, especially in the birdlife.

73-0775. Warmbrunn, K. (Landesanstalt fuer Pflanzenschutz, Stuttgart, Germany). **Einige Gedanken zur Verordnung ueber Anwendungsverbote und -beschraenkungen fuer Pflanzenschutzmittel vom 23. Juli 1971. [Considerations regarding the ban or limitation on the use of some pesticides imposed July 23, 1971.]** *Gesunde Pflanz. 24(1): 6-8; 1972.* (4 references) (German)

Practical implications of the total or partial ban

imposed on DDT, heptachlor, aldrin, endrin, and mercury seed treating agents in West Germany as of July 23, 1971, are discussed. The restricted use of DDT, heptachlor, aldrin, and endrin is permitted until 1974, but no deadline on the total ban on mercury has been imposed. DDT used in forestry can be replaced by lindane, a mixture of lindane with promecarb, or phorate. Heptachlor, formerly used on sugarbeets, can be replaced by lindane and possibly by methiocarb. Adequate substitutes for both aldrin and endrin are expected to be available in the near future. Although lindane is a possible substitute for some of the above pesticides, it must not be used on stored grain and grain products. Fully adequate substitutes for mercury seed treatment agents are being developed. The dioxin content of 2,4,5-T produced in Germany is 1 ppm, practically eliminating malformation hazards.

73-0776. Simal, J.; Creus, J. M.; Charro, A.; Boado, M. A.; Diaz, R.; Vilas, D. (Dept. Bromatol.-Toxicol. Anal. Quim. Aplic., Fac. Farm., Santiago de Compostela, Spain). **Contenido en dieldrin de pescados, moluscos y aguas de las rias de La Coruna, Betanzos-Ares y El Ferrol. [Dieldrin residues occurring in fish, molluscs and waters of the La Coruna, Betanzos-Ares and El Ferrol estuaries.]** *An. Bromatol. 23(1): 1-34; 1971.* (11 references) (Spanish)

Dieldrin was detected by gas-liquid chromatography in molluscs, fish, and water samples from the El Ferrol, Betanzos-Ares, and La Coruna estuaries after the sinking of a Sudanese ship. Water samples taken at different locations contained from 0.1 to 40 ppb of dieldrin; higher contamination levels (25, 35, and 40 ppb) noted on the right side of the estuary coincided with the presence of pesticide container debris and decreased to 0.005 ppb within five months. Dieldrin ranged from 0.09 to 0.45 ppm in clams and amounted to 0.02 ppm in spider crabs (whole body) in the El Ferrol waters. Sea mussels and clams of the Betanzos-Ares waters had dieldrin levels ranging from 0.7 to 2.1 and 0.02 to 0.32 ppm, respectively. Sea mussels of the La Coruna estuary had dieldrin levels reaching 13 ppm and were capable of concentrating the compound to 1000 times that of their aquatic environment. The dieldrin content in sea mussels from Villagarcia decreased from 7 to 0.7 ppm within 60 days. All molluscs were alive when collected for analysis, indicating a high resistance to dieldrin. In fish dieldrin levels ranged from 0.08 to 23 ppm depending on the fat content of the species.

73-0777. Viviani, R.; Crisetig, G.; Petruzzi, V.; Cortesi, P. (Inst. Biochim. Fac. Med. Vet. Univ. Bologna, Bologna, Italy). **Residui di bifenili policlorurati (PCB) nei tessuti muscolari di clupeiformi adriatici. [Polychlorinated biphenyl residues in muscular tissues of clupeids of the Adriatic Sea.]** *Atti Soc. Ital. Sci. Vet. 25: 429-433; 1971.* (11 references) (Italian)

Polychlorinated biphenyls (PCBs) were determined in muscular tissue extracts of anchovies (*Engraulis encrasicholus* L.), sardines (*Sardina pilchardus*), and sprats (*Clupea sprattus* L.) in November 1970 to evaluate the extent of pollution of the upper and middle Adriatic Sea. PCBs were separated from organochlorine pesticides on a silicic acid-celite column. Determination was by gas-liquid chromatography. Total lipid contents of the extracts prepared from 50 fish of each species were 12.8, 1.9, and 11.8% for sardines, anchovies, and sprats, respectively. PCBs varied from 0.18 to 0.96 ppm, and total DDT (including *p,p'*-DDT, *p,p'*-DDE, and *p,p'*-DDD (TDE)) ranged from 0.09 to 0.41 ppm in the anchovy. Sardines contained 0.37 to 1.06 ppm PCB and 0.33 to 0.71 ppm DDT. Sprats had PCB and DDT levels ranging from 0.62 to 0.92 ppm and 0.32 to 0.72 ppm, respectively. The PCB residues were computed as Clophen A50 and exceeded the total DDT levels in all samples investigated.

73-0778. Stevenson, F. J. (Dept. of Agronomy, Univ. of Illinois, Urbana, IL). **Role and function of humus in soil with emphasis on adsorption of herbicides and chelation of micronutrients.** *BioScience 22(11): 643-650; 1972.* (44 references)

Humus interacts with organic pesticides and other potentially toxic pollutants, enhancing soil quality. The effective application rate of a given adsorbable herbicide can vary as much as 20-fold depending on the nature of the soil. Adsorption by humus and clay also presents problems in determining the long-term fate of the herbicide in the environment. Adsorbed chemicals can be transported by erosion to lakes and man-made reservoirs where conditions might not be favorable for microbial degradation. Bonding mechanisms include ion exchange, hydrogen-bonding, van der Waals forces, and coordination through an attached metal ion. Ion exchange, which is limited to herbicides that exist as cations or become positively charged through protonation, may render the adsorbed molecule less susceptible to attack by microorganisms. Humus has the potential for promoting nonbiological degradation of many herbicides.

73-0779. Fleet, R. R.; Clark, Jr., D. R.; Plapp, Jr., F. W. (Dept. of Wildl. and Fish Sci., Texas A & M Univ., College Station, TX 77843). **Residues of DDT and dieldrin in snakes from two Texas agro-systems.** *BioScience 22(11): 664-665; 1972.* (12 references)

Organochlorine residues, primarily DDT, its derivatives, and some dieldrin were found in every sample of snakes from two study areas in Texas. Total residues were 14 to 386 times higher in snakes from the area with a history of heavy pesticide use. Species whose food is most closely associated with water generally had the highest residues. The trophic level also affected the residues. Analysis of fat bodies of embryos from one snake revealed residues equivalent to those found in the gravid female. Species diversity was greater in the low-residue area. Insecticide residues may or may not be a factor in differences observed in species composition.

73-0780. Oloffs, P. C.; Albright, L. J.; Szeto, S. Y. (Dept. of Biol. Sci., Simon Fraser Univ., Burnaby, British Columbia). **Fate and behavior of five chlorinated hydrocarbons in three natural waters.** *Can. J. Microbiol. 18(9): 1393-1398; 1972.* (13 references)

Water samples removed from two rivers and from the subtidal zone of Georgia Strait in British Columbia were treated with either 0.025 ppm of DDT, lindane, α-chlordane, or γ-chlordane, or 0.1 ppm Aroclor 1260 (PCBs). The samples were incubated in the laboratory for up to 12 weeks at the temperatures of these natural waters at the time of sampling. Lindane persisted in all water samples throughout the experiment, but large proportions of the other compounds were transported into the atmosphere during incubation except when the containers were sealed. No metabolic breakdown could

be demonstrated. As demonstrated with ^{14}C-γ-chlordane, uneven distribution of the pesticides occurred rapidly, but was prevented, or reversed, by addition of a surfactant to the water. Total bacterial counts were generally higher in treated than in untreated water samples. (Author abstract by permission)

73-0781. Wassermann, M.; Sofoluwe, G. O.; Tomatis, L.; Day, N. E.; Wassermann, D.; Lazarovici, S. (Hebrew Univ.–Hadassah Med. School, Dept. of Occup. Health, Jerusalem, Israel). **Storage of organochlorine insecticides in people of Nigeria.** *Environ. Physiol. Biochem. 2(2): 59-67; 1972.* (18 references)

Adipose tissue taken at autopsy from Nigerians with no known occupational exposure to organochlorine pesticides contained four organochlorines (or their metabolites). Fetal levels were 0.96 ppm total DDT; 0.19 ppm total BHC; 0.002 ppm dieldrin, and 0.006 ppm heptachlor epoxide. In the age group from 0 to 11 mo, the total DDT concentration was three times higher, with DDE averaging 45.5% of the material. Slightly lower levels of BHC were found. Average total DDT levels of 6.0 ppm, 4.7 ppm, 6.5 ppm, and 4.4 ppm were found in the age groups of 1 to 4 yr, 5 to 25 yr, 25 to 44 yr, and > 45 yr, respectively. The percentage of DDT varied between groups. Except in the age group of 5 to 24 yr there was a positive age-association for DDT-derived materials in tissue of both sexes. Accumulation of total DDT was greater in men than in women.

73-0782. Adams, W. A. (Inland Waters Directorate, Dept. of the Environ., Ottawa, Ontario, Canada). **Nerve gas–isopropylmethylphosphonofluoridate (GB) [sarin]–decomposition and hydrostatic pressure on the ocean floor.** *Environ. Sci. Technol. 6(10): 928; 1972.* (9 references)

A previous calculation for hydrolysis of sarin in seawater following leakage from buried containers of nerve gas gave a half-life of 52 min. The effect of hydrostatic pressure on the three detoxifying hydrolysis reactions was initially neglected. In the present report equilibrium constants and rate constants adjusted to 0.4 kbar and 1 kbar (the pressures found at depths of 4000 and 10,000 meters respectively) were inserted into the overall first-order rate equation. A reaction half-life of 65 min was calculated for 0.4 kbar and 25°C, and 88 min for 10,000 m and 25°C. The reduced decomposition rate and the enhanced rate of diffusion of chemicals at sea-floor pressures must be considered in relation to the disposal of sarin and other toxins.

73-0783. Woolson, E. A.; Kearney, P. C. (Agr. Environ. Qual. Inst., Agr. Res. Cent., U.S. Dept. of Agr., Beltsville, MD 20705). **Persistence and reactions of ^{14}C-cacodylic acid in soils.** *Environ. Sci. Technol. 7(1): 47-50; 1973.* (18 references)

Carbon-14-labeled cacodylic acid (hydroxydimethylarsine oxide) was prepared by reacting ^{14}C-methyl iodide with methyl dichloroarsine. Concentrations of 1, 10, and 100 ppm of cacodylic acid were established in three soils of varying iron and aluminum content. At 2, 4, 8, 16, 24, and 32 weeks, soils were analyzed for ^{14}C and total arsenic in the water-soluble (ws), calcium (Ca), iron (Fe), and aluminum (Al) fractions. Initially, cacodylic acid was distributed in the following fractions: ws ≫ Al > Fe > Ca. After 32 weeks, the distribution was ws > Al > Fe > Ca. In contrast, inorganic arsenate (5+) was largely present in the Fe and Al fractions. Cacodylic acid persistence was a function of soil type and after 32 weeks the following amounts of ^{14}C were recovered in each soil type by combustion: Christiana (23%), Hagerstown (53%), Lakeland (62%). A decrease in both total ^{14}C and total arsenic occurred in all soils with time. A pungent garlic odor was detected in soils receiving 100 ppm, suggesting the production of a volatile alkyl arsine. The loss of arsenic suggests that one route of cacodylic acid loss from aerobic and anaerobic soils is by alkyl arsine volatility. Degradation under aerobic conditions also occurred by cleavage of the C–As bond, presumably yielding CO_2 and AsO_4^{3-}. This degradation is presumably due to microbiological action. (Author abstract reprinted by permission of the American Chemical Society)

73-0784. Trojanowska, M.; Stankiewicz, Z.; Szucki, B.; Pomorska, K.; Majewska, B. (Res. Inst. of Rural Occup. Health and Hyg. and the Forensic Med. Dept., Lublin, Poland). **DDT and DDE content of human tissues.** *Forensic Sci. 1(2): 239-243; 1972.* (15 references)

Tissue samples taken at autopsy from 44 humans who had not been occupationally exposed to organochlorines contained DDE and DDT. The highest quantity was found in fatty tissue. Mean levels of DDT and DDE in subcutaneous fatty tissue were 5.70 and 5.43 mg/kg, in females and 4.66 and 7.46 mg/kg in males. Accumulation in the liver was almost 10 times less than in the fat; DDE represented about 72% of the total in liver and brain. Although higher levels of total DDT plus DDE were observed in tissues from subjects over 40 years old, the differences were not significant.

73-0785. Kanitz, S.; Castello, C.; Orlando, P. (Ist. Ig., Univ. Genova, Genoa, Italy). **Effetti delle radiazioni nella decomposizione dei residui di pesticidi clorurati negli alimenti. [Effects of radiation on the decomposition of organochlorine pesticide residues in foods.]** *G. Ig. Med. Prev. 12(1): 51-57; 1971.* (Italian)

The effect of γ-radiation on the breakdown rate of organochlorines such as aldrin, *o,p'*-DDT, *p,p'*-DDT, and *o,p'*-DDE in *n*-hexane and in aqueous solutions was studied. The breakdown rate of each compound in organic solution depended on its concentration. Solutions containing these compounds at 96 to 173

pg/ml required 1 Mrad to achieve 50% degradation of the pesticide. The same result was attained with 0.5 Mrad in *n*-hexane solutions containing the compounds at 16 to 22 pg/ml. Degradation of organochlorines in aqueous solutions containing compounds at 10 to 16 pg/ml occurred at higher rates: irradiation with 160 krad produced 85 to 90% breakdown of each compound; similar results in organic solutions required 2.9 Mrad of γ-radiation. Degradation of pesticides in oxygen-deficient aqueous solutions (oxygen levels below 1 mg/l.) occurred at rates similar to those found in *n*-hexane, indicating the importance of oxygen in radiation-induced breakdown processes. The γ-radiation dose required to control organochlorine contamination in fruit juices or canned vegetables was 160 krad and should not exceed 250 krad to prevent organoleptic alterations of the food product.

73-0786. Atabayev, Sh. T.; Gurevich, B. E.; Khasanov, Yu. U.; Zelinskaya, O. V.; Serebryakov, G. A. (Tashkent, Uzbekistan, USSR). **Materialy k gigiyenicheskoy otsenke primeneniya milbeksa v khlopkovodstve. [Materials concerning the hygienic evaluation of Milbex application in cotton cultivation.]** *Gig. Sanit. 37(9): 90-91; 1972.* (2 references) (Russian)

General hygienic aspects of the application of Milbex on cotton fields are outlined. Milbex residues persisted in the upper 10 cm soil layer for more than two months after application. Milbex penetrated slowly into the 10-20 cm layer which had a residual Milbex content of 0.2 mg/kg initially and 0.04 mg/kg at the end of two months. The air above Milbex-treated cotton fields contained Milbex for three days after application. The maximum allowable diurnal concentration in air is set at 0.2 mg/m^3 while a lower value of 0.1 mg/m^3 is used for zones of warm climate. The maximum allowable workplace concentration of Milbex is 1 mg/m^3.

73-0787. Ivakhnenko, A. G.; Spynu, Ye. I.; Patratiy, I. Z.; Ivanova, L. N. (All-Union Sci. Res. Inst. for Hyg. and Toxicol. of Pesticides, Polymers, and Plastics, Kiev, USSR). **Matematicheskoye prognozirovaniye prodolzhitel'nosti degradatsii pestitsidov v rasteniyakh po veroyatnostnym algoritmam metoda gruppovogo ucheta argumentov. [Mathematical prediction of the degradation time of pesticides in plants using probability algorithms of the arguments grouping method.]** *Gig. Sanit. 37(10): 43-48; 1972.* (4 references) (Russian)

A multiserial probability method is suggested for predicting the degradation times of pesticides in plants. Several pesticides have been classified according to degradation time as a function of 22 indices, including the physicochemical properties of the substance (molar weight, melting point, lipid solubility, water solubility, volatility, stability in alkaline and acid medium and especially in a pH range of 5-8); fat, protein, ash, sugar, and water content of the crop; the mode and conditions of application; and meteorologic conditions (temperature and rainfall). Three discretization levels were adopted, and the discrimination formula obtained permits determination of the kinetics of pesticides under various combinations of the above factors with an accuracy of 80%.

73-0788. Machimura, N.; Nasuda, K. (Sect. of Plant Pathol. and Entomol., Fukui Prefect. Agr. Exp. Sta., Fukui, Japan). **[Organochlorine insecticide residues in soil and absorption by crops.]** *Hokoriku Byogaichu Kenkyu Kaiho (Proc. Soc. Plant Prot. Hokuriku) 20: 71-75; 1972.* (9 references) (Japanese)

The effects of various treatments on the degradation rates of organochlorine insecticides in soil and their uptake by plants were investigated. Aldrin, endrin, dieldrin, and heptachlor epoxide were mixed with sterilized or unsterilized virgin clayey soil. A mature compost mixture was added to some specimens at 0.5-40 kg/m^2. The pH of some specimens was adjusted to 5-9 with calcium hydroxide. Soil lots were potted in 0.2 m^2 surface area Wagner pots and left fallow or sown with vegetable crops. Planted pots were watered every 10 days; in some unplanted pots the water level was kept 3-5 cm above the soil surface to simulate flooded paddy fields. Pots were kept outdoors for 90-200 days. The degradation rate in flooded soils was highest for aldrin, followed by endrin and dieldrin, with heptachlor epoxide far behind; degradation in non-flooded soils was 2-4 times slower. The insecticides were generally degraded more rapidly in unsterilized than in sterilized soil. About 7-8% of the chemical present was taken up by crops from untreated soil, 5-9% in sterilized soil, and uptake decreased with increasing amount of compost added. Effects of pH on degradation were equivocal.

73-0789. Koyama, S.; Iwata, K. (Niigata Prefect. Agr. Exp. Station, Nagaoka, Japan). **[On the actual residue of BHC in paddy fields and its translocation into rice plant.]** *Hokuriku Byogaichu Kenkyu Kaiho (Proc. Soc. Plant Prot. Hokuriku) 20: 76-80; 1972.* (13 references) (Japanese)

Soil residues and their translocation into rice plants were investigated in four fields where BHC had been applied and compared to those in a pesticide-free field to determine BHC residues in paddies after the ban of BHC. The soil sampling was done twice (early in spring before plowing and in autumn after rice harvest) in the center of the field at depths of 0-10, 10-20, 20-30, and 30-50 cm from the soil surface, with the specimens being air-dried and sifted through a 20mm sieve. The rice plants were collected at harvest and air-dried, their unpolished rice and straw being analyzed after extracting and cleaning up by the method described by Kawahara et al.(*Bunseki Kagaku* 20: 367-376; 1971) and extracts being determined by GC. The β-/total BHC in dried soil specimens at the depth of 0-10 cm in spring ranged

from 0.191/0.345 to 1.606/5.40 ppm compared to 0.038/0.111 ppm/ppm in control soil. After harvest they ranged from 0.103/0.221 to 0.325/0.986 compared to 0.040/0.084 ppm/ppm. In every field the residue after harvest decreased 1/2-1/10 of those found in spring. The same tendency was found in soils at the depth to 20 cm. The residues of BHC isomers ($\alpha,\beta,\gamma,\delta$) in unpolished rice taken from the fields ranged from lows of 0.011, 0.001, 0.0017, and 0.001, respectively, to highs of 0.033, 0.040, 0.023, and 0.008 ppm, respectively compared to 0.007, 0.001, 0.005, and 0.001 in controls. The average of total BHC was 0.21 ppm. The same residues in straw ranged from lows of 0.092, 0.085, 0.048, and 0.009 ppm to highs of 0.616, 0.885, 0.062, and 0.055 ppm compared to 0.103, 0.078, 0.041, and 0.008 in control fields, with total average BHC 1.87 ppm showing the concentration of BHC in rice straw and the fairly high absorption of BHC by rice plant. Between the isomers, the ratio of β-isomer in soil is 3.4-5.1 times that of technical BHC while in unpolished rice the ratio of γ-isomer is high and that of β-isomer is low. The finding that β-BHC is highly concentrated in soil and rice straw suggests the possibility of secondary pollution of the next crops grown there and of livestock products if such straw is used as cattle feed.

73-0790. Taira, M.; Hashimoto, S.; Shimohira, I. (Div. of Toxicol., Hyogo Prefect. Pub. Health Inst., Kobe, Japan). **[Organochlorine pesticide residues in human breast milk.]** *Hyogo-Ken Eisei Kenkyusho Kenkyu Hokoku (Bull. Hyogo Prefect. Pub. Health Lab.) 7: 19-23; 1972.* (12 references) (Japanese)

A total of 54 human breast milk samples obtained from health centers in various parts of Hyogo Prefecture between June and November 1971 was analyzed for BHC, DDT, and dieldrin. The total BHC content in milks from Tsuna, Takarazuka, and Toyooka averaged 0.070 ppm of which 0.67 ppm was β-BHC; milk from Tatsuno women contained 0.037 ppm total BHC. The total DDT content in milk from Tsuna and Takarazuka women averaged 0.035 ppm and that from Tatsuno and Toyooka women 0.013 ppm. The mean dieldrin contents were between 0.0003 and 0.0015 ppm. Five and seven women from Tsuna and Takarazuka, respectively, had milk containing pesticide residues higher than those permitted in cows' milk; this finding was rare in Tatsuno and Toyooka. The organochlorine levels in the human milk were not significantly correlated with the woman's daily consumption of cow's milk, duration of lactation, or percentage fat in the milk.

73-0791. Prati, L.; Del Dot, M. (Ist. di Igiene, Universita di Ferrara, Ferrara, Italy). **Ricerca sui livelli di accumulo di pesticidi clorurati organici di sintesi in tessuti adiposi umani nella provincia di Trento. [Studies on synthetic organochlorine pesticide accumulation levels in human adipose tissues in the province of Trento.]** *Ig. Mod. 64(1/6): 36-44; 1971.* (Italian)

Omental adipose tissue biopsies were performed in 31 subjects (16 rural and 15 urban residents) hospitalized in the surgery department of the Trento Hospital. Extraction, purification, and gas chromatography performed within 48 hours after biopsy revealed the presence of lindane, heptachlor epoxide, *p,p'*-DDT, *o,p'*-DDT, and *p,p'*-DDE in 13, 19, 97, 58, and 100% of the samples, respectively. Heptachlor, aldrin, dieldrin, and DDD (TDE) levels were below the sensitivity limits of the analytical procedures used. DDT represented 77% of the total DDT which amounted to an average of 16.75 ppm. Lindane, heptachlor epoxide, *p,p'*-DDT, and *o,p'* DDT averaged 0.02, 0.10, 2.89, and 0.49 ppm, respectively. The values found in Trento exceeded those recorded in other regions of Italy (Liguria, Lazio) as well as most of the data recorded in other countries.

73-0792. Ramachandran, B. V. (Nat. Chem. Lab., Poona 8, India). **Catalytic effect of phosphate and oximes on non-enzymic hydrolysis of diisopropyl phosphorofluoridate.** *Ind. J. Biochem. Biophys. 8(2): 112-113; 1971.* (9 references)

The effects of phosphate and oximes on the hydrolysis of DFP are briefly described. The non-enzymatic degradation of DFP under physiological temperature and pH conditions was accelerated by phosphate ions. The half-life in phosphate buffer was 238 min, compared to 100 min in bicarbonate. More rapid decomposition was also obtained in tris-acetic acid buffer. Certain oximes, including 2-PAM and toxogonin (obidoxime), further accelerated DFP hydrolysis in tris-acetic acid buffer.

73-0793. Tadic, Z. D.; Pesic, M. B.; Ries, S. K.* (Pestic. Res. Center, Horticulture, Michigan State Univ., East Lansing, MI 48823). **Thermal and acid dealkylation of some uracil derivatives.** *J. Agr. Food Chem. 21(1): 108-111; 1973.* (13 references)

The dealkylation of *N*-alkyl-5-halo-6-methyluracils and *N*-alkyl-6-methyluracils was investigated. Heating these compounds at 240 to 250° resulted in the elimination of the alkyl groups at position 3 yielding 6-methyluracils and certain olefins. This indicated that there may be a reaction mechanism similar to the *β-cis*-elimination (Chugaev reaction). A systematic study of the effect of halogen in position 5 and of the nature of the alkyl group in position 3 on the reaction of dealkylation at elevated temperatures indicated that the reaction is affected by these two factors. In some compounds the dealkylation by the action of concentrated HI was detected, but only *N-tert*-butyl-5-halo-6-methyluracil and *N-tert*-butyl-6-methyluracil dealkylated completely. Similar reactions may take place during in vivo degradation by plants. (Author abstract reprinted by permission of the American Chemical Society)

73-0794. Hilton, H. W.; Kameda, S. S.; Nomura, N. S. (Exp. Sta., Hawaiian Sugar Planters' Ass., Honolulu, HI 96822). **Distribution of picloram residues in sugarcane.** *J. Agr. Food Chem. 21(1): 124-126; 1973.* (6 references)

[^{14}C]Picloram absorbed through the roots of sugarcane plants (a hybrid of *Saccharum* spp.) accumulated in the leaves. Residues retranslocated from older to younger leaves without detectable radioactivity in either the apical meristem of the primary stalk or the stalk. With the depletion of the supply to the roots over a period of 13 weeks, the leaf residues reached a maximum and began to decline with a portion of the radioactivity lost from the plant in the senescent abscised leaves. Picloram had a constant linear inhibiting effect on the elongation of leaf tissue from the primary spindle. (Author abstract reprinted by permission of the American Chemical Society)

73-0795. Alley, E. G.; Dollar, D. A.; Layton, B. R.; Minyard, Jr., J. P. (Mississippi State Chem. Lab., Mississippi State, MS 39762). **Photochemistry of Mirex.** *J. Agr. Food Chem. 21(1): 138-139; 1973.* (6 references)

The photolysis of dodecachloropentacyclo-[5.3.0.0^{2,6}.0^{3,9}.0^{4,8}] decane (Mirex) in hydrocarbon solvents yielded two major products. These photoproducts have been identified as a monohydro derivative and a dihydro derivative. Possible structures for the derivatives (based on NMR, IR, and mass spectra) are discussed. (Author abstract reprinted by permission of the American Chemical Society).

73-0796. Lubkowitz, J. A.; Baruel J.; Revilla A. P. de; Cermeli, M. M. (Dept. de Technol. Nuclear, Inst. Venezolano de Invest. Cient., Apartado 1827, Caracas, Venezuela). **Residue studies of *O,S*-dimethyl phosphoroamidothioate on tomatoes.** *J. Agr. Food Chem. 21(1): 143-144; 1973.* (1 reference)

Residues of *O,S*-dimethyl phosphoroamidothioate (monitor) were determined in mature tomatoes. Residue values were obtained as a function of the insecticide doses and the time elapsed between final treatment and harvesting time. Plants treated with multiple doses of 0.5 kg of active ingredients/ha and 1.0 kg of active ingredients/ha yielded residues of 0.19 and 0.84 ppm, respectively, when harvested 18 days after the final treatment. Plants receiving one single treatment of 0.5 kg of active ingredient/ha yielded residues between 0.072-0.013 ppm. (Author abstract reprinted by permission of the American Chemical Society)

73-0797. Takenaga, T. (Inst. Agr. Machinery, Japan). **Knapsack type LV concentrate (ULV) sprayer.** *Jap. Pestic. Inform. 13: 5-10; 1972.*

Three types of low volume concentrate (LVC) or ultra low volume (ULV) pesticide sprayers are described and the operating conditions given for each example. Several application techniques, differing in the position of the lance, have been developed and used experimentally in Japan. LVC has an active ingredient content of less than 70% and a more even application than ULV. The average droplet sizes for an LVC are from 80 to 140μ. Holding the lance 3 to 5 degrees above the horizontal and making a swath of about 4 m swinging left to right, deposited 10^{-5} ml/gcm^2 10 ft from the end of the swath and 10^{-7} ml/9 cm^2 at 50 ft. Residues of cyanox deposited on cabbage leaves by LVC decreased logarithmically and reached tolerance levels after one week. The amounts of Sumithion L-80 (fenitrothion) sprayed by LVC which reached the operator's right arm and right knee were 0.75 and 2.35 mg/100 cm^2, and 0.85 mg was found on the mask after the spraying of 10 acres. Since the LD50 of Sumithion is about 800 mg/kg, there is no danger of oral or dermal toxicity. The LVC pesticide should have an acute LD50 below 100 mg/kg.

73-0798. Beall, Jr., M. L.; Nash, R. G. (Plant Sci. Res. Div., Agr. Res. Serv. U.S. Dept. of Agr., Beltsville, MD 20705). **Insecticide depth in soil-effect on soybean uptake in the greenhouse.** *J. Environ. Qual. 1(3): 283-288; 1972.* (29 references)

The influence of DDT, dieldrin, and endrin placement depth in soil on their plant uptake and translocation was investigated. In a greenhouse study soybeans were grown for 75 days in soil columns containing a 1-cm layer of 20 ppm ^{14}C-insecticide-treated soil placed 1-2, 16-17, or 31-32 cm deep (depths A, B, and C, respectively) within the column. Radioactivity in root sections showed that all three insecticides were absorbed and translocated both basipetally and acropetally. Maximum mean residues in roots (DDT, 14.9; dieldrin, 29.1; endrin, 29.5 ppm air-dry basis) always resulted from placement at depth A. Maximum DDT (<0.01 ppm), dieldrin (0.68 ppm), and endrin (1.20 ppm) residues in total aerial organs resulted from depth A also. Residues decreased strikingly as placement depth increased. The B depth resulted in mean aerial residues amounting to 6.8% (dieldrin) or 15.0% (endrin) of those resulting from A, while C depth resulted in mean aerial residues of only 0.6% (dieldrin) or 6.7% (endrin) of those from depth A. Only trace amounts of DDT residues resulted from depths B and C. Since uptake was affected by insecticide placement depth, prediction of crop residues based on soil residues must include a consideration of residue location in soil. Results suggest that deep plowing of insecticide-containing soil could be used to reduce residues in crop plants. (Author abstract by permission)

73-0799. Stevenson, F. J. (Dept. of Agron., Univ. of Illinois, Urbana, IL 61801). **Organic matter reactions**

involving herbicides in soil. *J. Environ. Qual. 1(4): 333-343; 1972.* (69 references)

Documentary evidence is presented in support of the view that organic matter plays a major role in the adsorption of herbicides in soil, and that organic matter content is usually the soil factor most directly related to herbicidal behavior. Major attention is given to the nature and origin of humic and fulvic acids, with special emphasis being given to the types of reactive sites responsible for the binding of pesticide chemicals. The various aspects of humus chemistry are discussed as they relate to investigations on herbicide-soil organic matter relationships, including the inadequacies of methylation procedures for blocking specific functional groups in connection with bonding mechanism studies. Adsorption mechanisms are suggested and possible chemical transformations brought about by organic substances are outlined. (Author abstract by permission)

73-0800. Nash, R. G.; Beall, Jr., M. L.; Harris, W. G. (Plant Sci. Res. Div., Agr. Res. Serv. U.S. Dept. of Agr., Beltsville, MD 20705). **Endrin transformations in soil.** *J. Environ. Qual. 1(4): 391-394; 1972.* (18 references)

A Lakeland sandy loam was treated at three depths with ^{14}C-endrin insecticide in which one crop of soybeans (*Glycine max* L., Merr.) was grown. After the soybeans were harvested, the soil was sectioned and assayed for endrin residues. At least three and possibly five transformation products of endrin occurred. Two products were identified as endrin delta ketone and endrin alcohol. A third product may have been endrin aldehyde. Endrin transformation appeared to increase with soil depth. In an extremely acid soil (pH 4.2) endrin transformed to some endrin ketone and probably endrin aldehyde during treatment of the dry soil, but not of moist soil. Acid or base treatment of endrin and several endrin isomers indicated that endrin was stable under basic conditions and the endrin alcohol and endrin aldehyde (presumably) were stable in all treatments tested except the base treatment at 100 C for endrin aldehyde. (Author abstract by permission)

73-0801. Stojanovic, B. J.; Hutto, F.; Kennedy, M. V.; Shuman, Jr., F. L. (Agron. Dept., Mississippi State Univ., State College, MS 39762). **Mild thermal degradation of pesticides.** *J. Environ. Qual. 1(4): 397-401; 1972.* (13 references)

In pesticide disposal studies partial degradation of 12 selected analytical grade pesticides was produced by heating the chemicals at temperatures between 100 and 400 C. Each pesticide was modified physically and chemically at a temperature at least 300-450 C below its complete combustion temperature. At these relatively low temperatures eight of the original nine solids (zineb, picloram, dieldrin, atrazine, bromacil, carbaryl, DNBP, and 2,4-D) remained solid while dicamba was converted to a liquid. The three liquids (DBCP, vernolate, and malathion) were all converted to solids. Eight of the original 12 compounds also yielded gray to brown to black residues upon heating. Infrared spectroscopic analyses indicated that the extent of degradation of the heated pesticides ranged from formation of a single degradation product to production of a mixture of compounds. Most pesticides, however, were degraded through loss of one or two substituents of the molecule by processes such as dehalogenation and decarboxylation. (Author abstract by permission)

73-0802. Ralls, J. W.; Cortes, A. (Western Res. Lab., Nat. Canners Ass., Berkeley, CA 94710). **Survey of food ingredient-DDT reactions under thermal processing conditions.** *J. Food Sci. 37(5): 760-763; 1972.* (8 references)

A preliminary investigation was carried out to determine which food components aid in the degradation of labeled DDT during thermal food processing. Samples were maintained at 100° for two hr and the relative percentages of radioactivity determined in five thin layer plate fractions of pot extract corresponding to DDT, DDE, TDE, and, tentatively, DCB (*p,p'*-dichlorobenzophenone) and DDOH (1,1,1,-trichloro-2,2-bis-(*p*-chlorophenyl)ethanol). In the pH range from 3 to 8, this factor alone did not have a major influence on DDT conversion. Approximately 10% of the DDT was lost on heating with yeast nucleic acid, DPN, or casein. Of the amino acids and peptides tested, cysteine and glutathione showed a higher level of conversion to TDE. Vitamins had only a small effect, and a combination of nine food components did not produce additive decomposition of DDT, probably because of the limiting concentration of DDT and interactions between the components.

73-0803. Yamada, T.; Kato, K.; Watanabe, S.; Nakaoka, T.; Wada, Y. (Kanagawa Prefect. Pub. Health Lab., Yokohama, Japan). **[Seasonal variation of residual pesticides in milk.]** *Kanagawa-Ken Eisei Kenkyusho Kenkyu Hokoku (Bull. Kanagawa Prefect. Pub. Health Lab.) 2: 41-49; 1972.* (7 references) (Japanese)

Individual and seasonal variations of pesticide residues were studied in raw milk obtained from 18 cows in August 1971-May 1972. Pesticides in the cows' feed were also determined. The quantities of residues found varied by less than an order of magnitude among individual cows. The residue levels generally declined over the lactation period. Total BHC averaged 0.5 ppm of which 0.4 ppm was β-BHC; total DDT averaged 0.008 ppm, approximately half was DDE; dieldrin averaged 0.001 ppm. Residues varied appreciably in cows from different farms. Residue levels in the cows' milk correlated with the pesticide quantities in the feed on a farm-by-farm basis. Total BHC in mixed feed averaged 0.1 ppm and total DDT was below 0.01 ppm. Dieldrin was present in feed at very low levels. Large amounts of BHC

(0.15 ppm) and DDT (0.013 ppm) were found in some specimens of rice straw which could account for much of the residue content in the milk.

73-0804. Solovyeva, Ye. I.; Gvozdikova, L. G.; Berlyant, O. Ya. (Ukrainian Res. Inst. for the Canning Industry, Kiev, USSR). **Izmeneniye soderzhaniya pestitsidov v protsesse pererabotki plodov. [Changes in the pesticide residue contents occurring in the course of fruit processing.]** *Konserv. Ovoshchesush. Prom. 27(5): 24-26; 1972.* (4 references) (Russian)

Changes occurring in the pesticide residue contents during the processing of fruits from orchards treated with metathion (fenitrothion) and carbaryl were studied. Washing the fruits to be processed with tap water at 15-35°C reduced the carbaryl and metathion contents to 50 and 62% of the respective original levels. Washing with 0.5% sodium hydroxide solution reduced the carbaryl residue level to 70% and the metathion content to 84%. Blanching with 0.5% sodium hydroxide solution and sugar syrup decreased the carbaryl and metathion residue contents to 45 and 60% of the original values. No changes in the residue levels in preserved fruits were detected during 12 months of storage. It is recommended that pesticide-treated fruits be cleaned with a 0.5% NaOH solution prior to washing in order to reduce the residue contents.

73-0805. Hornabrook, R. W.; Dyment, P. G.; Gomes, E. D.; Wiseman, J. S. (Inst. of Human Biol., Papua, New Guinea). **DDT residues in human milk from New Guinea natives.** *Med. J. Aust. 1(25): 1297-1300; 1972* (12 references)

Of the 74 human samples from New Guinea analyzed for DDT and dieldrin, 14 were pesticide free. The level of contamination varied considerably even within a district. In Marawaka, the most remote area tested, one sample contained 7.50 ppb *p,p'*-DDE, 6.24 ppb *p,p'*-DDT, and 2.47 ppb dieldrin while others had no detectable levels. Larger residues were found in areas subject to malaria control programs or exposed to Western contact for a greater length of time. Unexpectedly, mean DDE levels of 29.0 and 95.9 ppb in some areas fell in the range of European and American values. Exact sources of contamination are not known. Dissemination of DDT by such natural processes as tropospheric air currents could be partially responsible.

73-0806. Anonymous. **Antiparassitari e sangue umano. [Pesticides and human blood].** *Minerva Med. 62(Suppl. 40): 12; 1971.* (Italian)

Analytical findings in 98 blood samples collected in a well-developed agricultural area in Italy showed no significant differences in the average lindane, heptachlor, aldrin, or heptachlor epoxide levels of various occupational groups (agricultural workers, students, craftsmen, and housewives). The whole population appears to be equally exposed to these compounds; residues occur in vegetables, flours, fruits, and other edible products. Attention is drawn to the negative aspects of widespread insecticide use and the need for action by the public health authorities.

73-0807. Komar, M.; Jan, J.; Milohnoja, M. (Biotechnological Sch., Dept. Vet. Med., Ljubljana, Yugoslavia). **Klorirani ugljikovodici u pasteriziranom mlijeku u Sloveniji. [Chlorinated hydrocarbons occurring in pasteurized milk in Slovenia.]** *Mljekarstvo 22(4): 90-92; 1972.* (4 references) (Slovenian)

Pasteurized milk samples collected from several locations in Slovenia in 1970 and 1971 were heavily contaminated with organochlorine residues. Alpha-HCH (BHC) (0.0004-0.006 ppm) and DDT (0.003-0.046 ppm) were found in all samples. *p,p'*-DDE (0.0016-0.024 ppm) and *p,p'*-DDT (0.0008-0.023 ppm) were present in all samples analyzed; *o,p'*-DDT (averaging 0.008 ppm), and *p,p'*-DDD(TDE) (averaging 0.0014 ppm) were found in 50% and 65% of the milk samples. Lindane (averaging 0.009 ppm) and dieldrin (averaging 0.008 ppm) were found in 90% and 85% of the samples, respectively. In terms of maximum allowable pesticide concentrations in foods, none of the samples was within the limit for BHC, 5% of the samples exceeded the lindane tolerance limit of 0.0005 ppm, 55% of the samples exceeded the total DDT tolerance limit of 0.005 ppm, and 13% of the samples exceeded the 0.003 ppm dieldrin tolerance limit. Although use of α-BHC and dieldrin has been banned and DDT and lindane limited, the hazards resulting from their low breakdown rate should still be considered.

73-0808. Bogan, J. A.; Bourne, W. R. P. (Univ. of Glasgow, Dept. of Vet. Pharmacol., Vet. Hospital, Bearsden, Glasgow G61 1QH, Scotland). **Organochlorine levels in Atlantic seabirds.** *Nature (London) 240(5380): 358; 1972.* (8 references)

In an investigation of over 100 birds from a representative range of species found between Scotland and the Arctic, all birds contained organochlorines, primarily polychlorinated biphenyls (PCB) and *p,p'*-DDE. The PCB to DDE ratio was between 2 and 10 in all but the kittiwake in which the ratio was always higher. The total organochlorine content in muscle and liver was low in auks and shearwaters. Highest levels were found in large gulls and skuas feeding largely around trawlers in winter and seabird breeding stations in summer. PCB levels were as high as 535 ppm. Liver levels in birds caught or shot were about the same as those in muscle, but birds found dead had markedly higher liver levels. One chick examined contained only 1/10 the amount found in the adult accompanying it. Organochlorine contents did not differ substantially in different areas except in the Davis

Strait where the puffins began to show a diminution. Neurological signs were observed in one bird whose liver contained 311 ppm PCB and 67 ppm DDE.

73-0809. Albone, E. S.; Eglinton, G.; Evans, N. C.; Rhead, M. M. (Organic Geochem. Unit, School of Chem., Univ. of Bristol, Bristol BS8 1TS, England). **Formation of bis(*p*-chlorophenyl)acetonitrile (*p,p'*-DDCN) from *p,p'*-DDT in anaerobic sewage sludge.** *Nature (London) 240(5381): 420-421; 1972.* (7 references)

In the presence of biologically active anaerobic sewage sludge, bis(*p*-chlorophenyl)acetonitrile (*p,p'*-DDCN) was identified by GC-MS in conjunction with radiochemical techniques as one of the products of DDT degradation, along with TDE and other metabolites. It was not determined whether the degradation was chemical or microbiological. Toxicological properties of DDCN are not well known but the contribution to pesticide residues of the more polar metabolites of DDT should not be ignored.

73-0810. Jensen, S.; Goethe, R.*; Kindstedt, M.-O. (Univ. of Stockholm, Div. of Chem., The Wallenberg Lab., Lilla Frescati, *S*-104 05 Stockholm 50, Sweden). **Bis-(*p*-chlorophenyl)-acetonitrile (DDN) [*sic*], a new DDT derivative formed in anaerobic digested sewage sludge and lake sediment.** *Nature (London) 240(5381): 421-422; 1972.* (5 references)

Activated sludge (1 liter) incubated in a nitrogen atmosphere with 100 mg of DDT containing some DDE and TDE consumed the insecticide rapidly. The half-life was seven hours, and products found in the sludge included TDE, DBP (*p,p'*-di-chlorodi-phenylbenzophenone), DDMU, and a product not previously identified, bis-(*p*-chlorophenyl)-acetonitrile (DDCN). Mass spectra and GC were used to establish the structure of this product. No changes were observed in the concentrations of TDE and DDCN after the DDT was consumed, indicating a direct formation of DDCN from DDT. No DDCN was produced when TDE or DDE was added to activated sludge. DDCN, not previously detected in nature because of its polar properties, was present at 0.6 ppm/dry wt in sediments from Lake Maelaren in Sweden.

73-0811. Saint-Ruf, G. (Centre Marcel Delepine du C.N.R.S., 45045 Orleans-Cedex, France). **Formation of "dioxin" in the pyrolysis of sodium α-(2,4,5-trichlorophenoxy)-propionate.** *Naturwissenschaften 59(12): 648; 1972.* (3 references)

Dioxin was identified in residues which resulted from heating the sodium salt of α-(2,4,5-trichlorophenoxy)-propionic acid to about 500°C. Several unidentified products were also observed. Although the quantity of dioxin formed was considerably less than that formed with derivatives of 2,4,5-T, it is sufficiently high to make the use of herbicides having an α-(2,4,5-trichlorophenoxy)-propionic acid base extremely dangerous, especially where treated matter is likely to be used as foodstuffs.

73-0812. Hughes, J. T.; Wilson, P. D. (Chem. Div., Dept. of Sci. and Ind. Res., Private Bag, Petone, New Zealand). **Endosulfan residues on tomatoes, potatoes, cabbages, and cauliflowers.** *N. Z. J. Agr. Res. 15(3): 495-505; 1972.* (3 references)

Endosulfan residues (including the sulfate and α- and β-endosulfan) were determined on tomatoes, potatoes, cabbages, and cauliflowers experimentally sprayed with the emulsifiable concentrate (EC) formulation and the wettable powder (WP) formulation. A hexane extraction and florisil cleanup followed by electron capture GC were satisfactory for the determinations. Residues on tomatoes exceeded 2 ppm, the New Zealand tolerance limit, in only one of four samples taken on the final day of spraying. The residue loss was slow but observable and indicated that no significant penetration had occurred. The mean residue on outer leaves of cabbage was 25.5 ppm, compared to 0.53 ppm in the heart; the 2 ppm level was reached on these leaves only after three weeks. Cauliflower flowers contained mean residues of 0.44 ppm and 0.50 ppm with EC or WP, respectively. Taking into account the residues on marketable portions of the leaves, a period of one week would be necessary to achieve cauliflower residues below two ppm. No significant amounts of any form of endosulfan were found in potatoes. The relative persistence of the β-isomer as compared to the α-isomer was confirmed by this study, as was the formation of endosulfan sulfate.

73-0813. Warnick, S. L. (Intermountain Lab., Salt Lake City, UT). **Pesticides in Utah people.** *IN: Proceedings of the Twenty-fourth Annual Meeting of the Utah Mosquito Abatement Association, 1971, pp. 9-13.* (20 references)

Organochlorine insecticide levels determined over a 5 yr period in 1417 serum and 103 adipose tissue samples from a representative cross-section of Utah people were similar to those reported elsewhere in the U.S. The residues measured, DDT, DDE, and dieldrin, showed decreasing storage since 1966. Mean values of total DDT in adipose tissue were 9.0 ppm in 1968, 7.2 ppm in 1969, and 5.3 ppm in 1970. Persons occupationally exposed to pesticides had levels significantly higher than those of the general population as did persons over 21 yrs old. No significant differences in levels were noted between males and females although large standard deviations were used or among races where only a limited number of samples was available. No correlation was observed between pesticide levels in serum and adipose tissue of subjects. The relationships

between serum levels and residues in food or house dust were not significant, but a higher correlation was obtained with house dust. Also investigated during the study were various methods for the extraction of the pesticides; the 2-hr rotorack extraction gave the best recovery.

73-0814. Yaklich, R. W.; Demoranville, I. E.; Devlin, R. M. (Lab. of Exp. Biol., Cranberry Experiment Station, Univ. of Massachusetts, E. Wareham, MA). **Naptalam estimation in cranberry bog soil.** *Proc. Northeast Weed Sci. Soc. 26: 293-296; 1972.* (2 references)

Results of naptalam residue determinations in cranberry bog soil treated for three consecutive years with Morcran (naptalam plus chlorpropham) suggest that annual applications result in a build-up of the herbicide in bog soil until a balance is reached between persistence and breakdown. The levels found at the plateau were dependent on the amount of naptalam applied. A balance was reached after two years for rates equivalent to 8 and 10 lb a.i./A of naptalam. Naptalam residues in the 1 to 4 inch soil samples taken at two and three years from plots receiving 8 lb a.i./A naptalam ranged from 0.60 to 0.66 ppm. Samples taken at the same depth from plots treated with 10 and 12 lb a.i./A had residues of 0.07 to 0.73 ppm and 0.96 to 1.13 ppm, respectively. Considerably less naptalam was found in the 4 to 8 inch samples, but they also exhibited an upward trend.

73-0815. Holden, A. V.; Topping, G. (Freshwater Fish Lab., Pitlochry, Scotland). **XIV. Occurrence of specific pollutants in fish in the Forth and Tay estuaries.** *Proc. Roy. Soc. Edinburgh (Sec. B) 71(2/4): 189-194; 1972.* (2 references)

Fish, crustacea, and shellfish from the Forth and Tay estuaries and similar samples from Scottish coastal waters were examined for organochlorines and heavy metals. Neither estuary showed evidence of higher than normal levels of organochlorines in herring, sprat, and mussels. Herring from the Firth of Clyde contained 0.21 mg total DDT/kg wet weight of muscle, significantly more than all other fish examined. Other samples also indicated high contamination in this area. No particular differences in mercury, lead, cadmium, copper, and zinc contamination could be found among various coastal areas in Scotland. General contamination in the Forth or Tay does not appear to be above average although fish samples may not represent conditions in the inner sections of the estuaries.

73-0816. Eichler, D. (C. H. Boehringer Sohn, 6507 Ingelheim, Germany). **Bromophos and bromophos-ethyl residues.** *Residue Rev. 41: 65-112; 1972.* (129 references)

The physicochemical properties and toxicity of the two widely used thionophosphate esters, bromophos and bromophos-ethyl, are described. Several studies have been carried out to elucidate their metabolism. The primary metabolite is dichlorobromophenol, and the oxygen isologs (oxons) occur only in traces or not at all. Qualitative and quantitative methods for determining residues of bromophos and bromophos-ethyl and their oxons are discussed in detail with reference to the relevant literature. The techniques employed include a number of chromatographic methods, colorimetry, the isotope technique, combined thin-layer chromatography-enzyme methods, and biological tests. The decomposition of residues in vegetable and animal products and in soils is dealt with in detail. Results obtained by applying the compounds as they would be used under practical conditions are discussed, and there is definite evidence that bromophos decomposes more rapidly than bromophos-ethyl. This correlates with the decomposition rates of other organophosphates whose methyl esters usually produce lower residue levels than the corresponding ethyl esters. A number of parallel tests were carried out to analyze the bromoxon and the bromoxon-ethyl levels. The results indicate that only very small amounts of the oxons occur and that levels are sometimes so low that they cannot be estimated. A general conclusion is that residue levels of bromophos and bromophos-ethyl in plants depend on a number of factors, including botanical species, morphological structure, weather conditions, formulation, method of treatment, and time of treatment. (Author abstract by permission, abridged)

73-0817. Morrison, F. O. (Dept. of Entomol., Fac. of Agr., Macdonald College of McGill Univ., Quebec, Canada). **A review of the use and place of lindane in the protection of stored products from the ravages of insect pests.** *Residue Rev. 41: 113-180; 1972.* (466 references)

Since 1945 formulations of BHC and of its gamma isomer (lindane) have been widely tested, recommended, and used as stored products protectants with general success. Direct application to stored grains, residual applications in storage areas, and both discontinuous and continuous vaporization have been employed. Lindane residues have been found in rainwater in England, in air, in many cereal foodstuffs, in milk, in butter, in eggs, in liver and kidney fats, and in human fat in several countries, but the levels are well below those considered hazardous. Processing foods generally reduces the levels but baking does not. Animals fed lindane or exposed to it accumulate residues, especially in their fat, but on the cessation of exposure elimination is rapid. The estimated dietary intake for the United States is less than one six-hundredth the FAO-WHO acceptable daily intake. Concern has been expressed over frequent reported associations between lindane exposure and human blood dyscrasias. There does not appear to be any proof of a causal relation here, but enough evidence exists to generate suspicion and justify more study. Lindane is now banned in Sweden and in Finland. New legislation in

Canada is limiting its field use, and no registrations for stored-products protection seem likely to be allowed. In the United States the situation is similar. England has not legislated against lindane and its use in storage areas probably continues. (Author abstract by permission, abridged)

73-0818. Beynon, K. I.; Wright, A. N. (Shell Res. Ltd., Woodstock Agr. Res. Centre, Sittingbourne, Kent, England). **The fates of the herbicides chlorthiamid and dichlobenil in relation to residues in crops, soils, and animals.** *Residue Rev. 43: 23-53; 1972.* (196 references)

The degradation of the closely related herbicides chlorthiamid (2,6-dichlorothiobenzamide) and dichlobenil (2,6-dichlorobenzonitrile) in plants, soils, waters, and animals has been reviewed. In soils chlorthiamid is readily converted to dichlobenil. In the field much dichlobenil is lost by evaporation and the remainder is converted biologically to 2,6-dichlorobenzamide. Uptake of dichlobenil from nutrient solutions by plants leads to volatilization of unchanged dichlobenil and formation of conjugates of 2,6-dichloro-, 3-, and 4-hydroxybenzonitriles. However, when plants are grown in soils treated with chlorthiamid and dichlobenil, they are also exposed to residues of 2,6-dichlorobenzamide, and this may be the chief source of residues in such plants. These residues are mainly 2,6-dichlorobenzamide together with small amounts of free and sugar-conjugated 2,6-dichloro-3-hydroxybenzamide, rather than the nitrile derivatives formed from direct treatment with dichlobenil. Evidence for the formation of 2,6-dichlorobenzoic acid as a metabolite in crops and soils is contradictory. Chlorthiamid and dichlobenil are readily eliminated by animals and are converted to hydrophilic conjugates of compounds including 2,6-dichloro-3-hydroxybenzonitrile with smaller amounts of the 4-hydroxy isomer and of acids including 2,6-dichloro-3-hydroxybenzoic acid. There was no evidence of displacement of the carbon atom of the nitrile groups. The processes of metabolism in plants, soils, and animals all involve the formation of more hydrophilic compounds including 2,6-dichlorobenzamide, phenols and their conjugates, and these are unlikely to be accumulated in animal tissues. (Author abstract by permission, abridged)

73-0819. Verloop, A. (Res. Labs., N. V. Philips-Duphar, Weesp, The Netherlands). **Fate of the herbicide dichlobenil in plants and soil in relation to its biological activity.** *Residue Rev. 43: 55-103; 1972.* (88 references)

The principal uses as well as chemical and physical properties of dichlobenil (2,6-dichlorobenzonitrile) are surveyed. Although dichlobenil is rather volatile, the main degradation product, 2,6-dichlorobenzamide (BAM), is stable in soil where degradation is primarily microbial. Dichlobenil degradation in whole plants or excised tissues used in physiological and biochemical studies can interfere with the interpretation of results. Dichlobenil is absorbed by the roots and translocated rapidly in bean seedlings. Evaporation and degradation, competitive processes, occur in the leaves. The principal metabolic pathway is hydroxylation, followed by conjugation. Hydrolysis to BAM and 2,6-dichlorobenzoic acid is at most a minor metabolic route in plants. BAM, formed in soil, and its hydroxy metabolite are rapidly transported by plants and are the chief sources of residues under practical conditions. Residues are present mainly in leaves rather than fruits. Dichlobenil rather than its metabolites is responsible for herbicidal activity. Side effects of dichlobenil include collar necrosis in sensitive plants and leaf margin chlorosis caused by BAM. (Author abstract by permission, abridged)

73-0820. Almeida, M. E. W.; Barretto, H. H. C. (Inst. Adolfo Lutz, Sao Paulo, Brazil). **Residuos de pesticidas clorados em leite consumido em Sao Paulo. [Chlorinated pesticide residues in milk consumed in Sao Paulo, Brazil.]** *Rev. Inst. Adolfo Lutz 31: 13-20; 1971.* (10 references) (Portuguese)

All seventeen commercial milk samples collected in Sao Paulo from July-September of 1970 were contaminated with BHC. Total BHC ranged from 0.007 to 0.055 ppm with 50% of the samples averaging 0.050 ppm. Isomers such as α-, β- + γ-, and δ-BHC ranged from 0.001 to 0.046, 0.001 to 0.028, and 0 to 0.005 ppm, respectively. Four samples of parmesan cheese contained α-BHC from 0.115 to 1.300 ppm, β- and γ-BHC (lindane) from 0.145 to 1.350 ppm, and δ-BHC from traces to 0.650 ppm in the fatty portion of the product. Total BHC levels ranged from 0.260 to 2.345 ppm. BHC residues in milk and dairy products are not permitted according to the Brazilian legislation.

73-0821. Lara, W. H.; Barretto, H. H. C.; Takahashi, M. Y. (Secao de Aditivos e Pesticidas Residuais, Inst. Adolfo Lutz, Sao Paulo, Brazil). **Residuos de pesticidas clorados em conservas de carne bovina.[Chlorinated pesticide residues in canned beef.]** *Rev. Inst. Adolfo Lutz 31: 63-70; 1971.* (9 references) (Portuguese)

One hundred and twenty export canned beef samples including 45 corned beef, 45 roast beef, and 30 chopped beef, manufactured in Sao Paulo,were analyzed for BHC; all were contaminated. Total BHC reached the upper limits of 1.20, 1.30, and 1.69 ppm in the fatty portion of the corned, chopped, and roast beef samples, respectively. Sixty percent of the corned, 66% of the chopped, and 46% of the roast beef samples had BHC levels exceeding 0.3 ppm levels with average figures amounting to 0.40, 0.37, and 0.41 ppm, respectively. Alpha-, β-, γ-, and δ-BHC isomer peaks (the latter below 0.01 ppm) were identified in all the samples. Traces of

BHC residues in meat or derived products are not permitted according to the Brazilian legislation. Information on the source of contamination was contradictory.

73-0822. Hitaka, K.; Ohe, T.; Fujiwara, K. (Kyoto City Inst. of Pub. Health, Nakagyo, Kyoto, Japan). **[Studies on polychlorobiphenyls and organochlorine pesticide residues in corbiculae.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 13(6): 523-530; 1972.* (22 references) (Japanese)

Residues of polychlorobiphenyls (PCBs) and organochlorine pesticides were studied in corbiculae from Lake Biwa in an attempt to estimate when contamination had occurred in the environment. Specimens of corbiculae taken from 15 places scattered on the coast of the lake in 1963 were preserved in formalin and specimens from 9 places in 1971 were frozen until the analysis. Meat parts of corbiculae were blended with anhydrous sodium sulfate and *n*-hexane for 5 minutes. The fat extract was cleaned up by the twin-dry column method. Gas chromatography with an electron capture detector was used for qualitative and quantitative analyses of the residues. DDE was determined by difference in the GLC peak areas before and after oxidation according to the modified method of Westoo et al. (*Acta Chem. Scand.* 24: 1039; 1971). PCBs, BHC, DDT, and dieldrin were detected in all specimens in both 1963 and 1971. Residue levels in 1963 were as follows: total BHC 0.013-0.075, total DDT 0.031-0.14, dieldrin 0.001-0.004 ppm on a fresh meat basis. Levels in 1971 were as follows: total BHC 0.087-0.025, total DDT 0.038-0.093, and dieldrin 0.002-0.004 ppm. Quantitative analysis of PCBs was done by comparing the area under the two major peaks with Kanechlor-500 (a commercial PCB mixture). Levels of PCB in 1963 and 1971 were 0.04-2.4 and 0.06-1.1 ppm, respectively.

73-0823. Li, G.-C.; Felbeck, Jr., G. T. (Dept. of Food and Resource Chem., Univ. of Rhode Island, Kingston, RI). **Atrazine hydrolysis as catalyzed by humic acids.** *Soil Sci. 114(3): 201-209; 1972.* (30 references)

The hydrolysis of atrazine was studied in the presence of hydrogen ion, buffer ion, and humic acid. The half-life was lowest at a low pH and increased with increasing pH. The rate of hydrolysis was proportional to the buffer concentration in acetate buffer solution at pH 4. This catalytic action may be due to the non-ionized carboxyl group, which could form a hydrogen bond with atrazine, or to the buffer anion, possibly working as a nucleophilic reagent directing attack on the carbon atom with replacement of chlorine. The data indicates that hydroxyatrazine was the degradation product in buffer solutions. A first-order reaction rate in relation to concentration was obtained for atrazine hydrolysis in an aqueous suspension of humic acid (pH 4). Fifty percent of the herbicide was hydrolyzed within 10 hr at 0.4 g humic acid/10 ml. A reduction of the activation energy by both humic acid and acetate buffer ion was probably due to hydrogen bonding. Based on the Arrhenius frequency factor, the atrazine molecules might have lined up more correctly on humic acid than acetate buffer, resulting in an increased concentration of reactant.

73-0824. Anonymous. **Keine Vergiftungsgefahr durch Quecksilber in der BRD. [No danger of mercury poisoning in the Federal Republic of Germany.]** *Staedtehygiene 23(7): 175; 1972.* (German)

In view of the mercury poisonings among Iraqis who ate fungicide-treated seed grain, the mercury situation in the Federal Republic of Germany is discussed. In the dry matter of cereal grains which were not treated with fungicides, 0.02 ppm of mercury was measured. The grains which grew from fungicide-treated seeds contained no more mercury than this because of the natural mercury content of the soil, which varies between 90 and 240 g/hectare. Fungicides introduce 5 g mercury/hectare or 2 to 3% of the natural concentration into the soil. About 0.5 to 1.2 per cent of the mercury is converted into a soluble form by microorganisms annually, so that it is able to enter food plants. The mercurial fungicides are valuable in agriculture without greatly increasing the natural mercury concentration of the soil.

73-0825. Koeman, J. H.; Bothof, T.; De Vries, R.; Van Velzen-Blad, H.; Vos, J. G. (Inst. of Vet. Pharmacol. and Toxicol., Utrecht, The Netherlands). **The impact of persistent pollutants on piscivorous and molluscivorous birds.** *TNO-Nieuws 27(10): 561-569; 1972.* (24 references)

The possible toxic environmental effects of polychlorinated biphenyls (PCB), DDE and other organochlorines, and mercury were studied in four species of aquatic birds. Based on laboratory observations, the mean PCB levels of 190 and 319 ppm found in brain and liver, respectively, of dead cormorants appeared to be responsible for their deaths. Although liver necrosis and hepatic porphyria normally accompany PCB intoxication, neither of these were observed in cormorants. Thinner cormorant eggshells seemed to coincide with high residues of PCBs and DDE. Mercury in these birds was well below the toxic level. Herons appeared to be less susceptible to PCB toxicity than cormorants in laboratory studies. Although herons found dead in the field contained high levels of PCB and some organochlorines, it is unlikely that their deaths resulted from it. Residues in heron eggs and thinning of the shell were similar to those in cormorants. In the sandwich tern pesticide levels have decreased since measures were established to eliminate pollution by pesticide manufacturing plants. DDE appears to be responsible for eggshell thinning in this species. Eider ducks would be affected by a rise in

PCB contamination although present levels are not considered toxic. No evidence was found in any of the species that breeding was abnormal.

73-0826. Fuchs, P.; Rooth, J.; Vos, R. H. de (Res. Inst. for Nat. Manage., Kemperbergerweg 11, Arnhem, The Netherlands). **Residue levels of persistent chemicals in birds of prey and owls in The Netherlands in the period from 1965-1971.** *TNO-Nieuws 27(10): 532-541; 1972.* (29 references)

In The Netherlands residue levels of organochlorines in livers of dead birds of prey and owls have been declining since 1962/1969 when an official ban on the use of aldrin, dieldrin, and heptachlor for seed dressing was enforced. Mean levels of dieldrin decreased most sharply in the buzzard from 7.61 to 0.10 ppm. Hexachlorobenzene (HCB) levels declined markedly and DDE levels slowly except in the buzzard. Polychlorinated biphenyls have also tended to decline. Striking differences were found between species of birds with respect to total organochlorines and ratios of these compounds. Differences in rates of elimination as well as in eating habits may account for differences in pesticide residues. Both granivorous and predatory birds reflected local variations in the use of organochlorines. The drastic population decline observed before 1968 has slowed or even reversed in most species since the initiation of restriction on the use of some organochlorines and methyl mercury in agriculture.

73-0827. Keij, P. G.; Kruizinga, D. (Inst. for Vet. Pharmacol. and Toxicol., TNO, Utrecht, The Netherlands). **Pesticides and badgers.** *TNO-Nieuws 27(10): 584-588; 1972.* (9 references)

Badgers living in a nature preserve surrounded by orchards regularly treated with pesticides, especially DDT (the most prevalent and persistent), were studied. In the rainy season badgers ate mostly earthworms found in the orchard. The uptake of DDT and its metabolites was estimated from the concentrations in earthworms and in badger feces. Calculations revealed approximately 8 μg of DDT would be assimilated if the badger consumed 500 g of earthworms daily. This amount is not considered toxic for an animal of the badger's size.

73-0828. Nishigaki, S.; Tamura, Y.; Toba, K.; Shimamura, Y.; Kimura, Y. (Dept. of Food Hyg. and Nutrition, Tokyo Metropolitan Res. Lab. of Pub. Health, Tokyo, Japan). **[Investigation of organochlorine pesticide levels in various foods as of Dec. 1971 in Tokyo.]** *Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health) 23: 217-229; 1971.* (3 references) (Japanese)

Organochlorine pesticide residue levels were determined in 108 samples of meats, dairy products, vegetables, and fruits widely consumed by Tokyo residents. The average total BHC levels found were 1.6 ppm in beef, 0.02 ppm in pork, 0.03 ppm in broilers, 1.5 ppm in butter, 0.02 ppm in cheese, 0.03 ppm in powdered infant formula, and 0.03 ppm in nuts. The average total DDT obtained was 0.10 ppm in beef, 0.06 ppm in pork, 0.10 ppm in broilers, 0.57 ppm in butter, 0.05 ppm in cheese, 0.04 ppm in infant formula, and 0.003 ppm in nuts. Dieldrin (including aldrin) residues were 0.007 ppm in beef, 0.02 ppm in pork, 0.03 ppm in broilers, 0.07 ppm in butter, undetectable in cheese, 0.001 ppm in infant formula, and 0.05 ppm in nuts. The pesticide levels in fruits and vegetables were quite low. The residues found were well below the acceptable daily intake (ADI) values in the case of all pesticides except aldrin/dieldrin, which approached the ADI value in many cases and even exceeded the ADI by 100% in broilers.

73-0829. Doguchi, M.; Ushio, F.; Nishida, K. (Dept. of Food Hyg. and Nutrition, Tokyo Metropolitan Res. Lab. of Pub. Health, Tokyo, Japan). **[Pesticide residues in wild birds in Japan.]** *Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health) 23: 265-270; 1971.* (7 references) (Japanese)

Organochlorine pesticide residue levels were measured in 41 wild birds caught in Japan in 1970-71 (nine species, three migratory) as an index of environmental pollution. Of the four most numerous species, Kamchatkan rustic bunting, dusky thrush, brambling, and Japanese tree sparrow, the dusky thrush contained the largest quantities of total BHC and DDT. The body of the dusky thrush, after removal of head, feathers, and viscera, contained 0.174 ppm total BHC and 0.292 ppm DDT on a wet basis. Residues in heads of Japanese tree sparrows were 3-4 times higher than in the body. The highest breast muscle pesticide residues were found in eastern great white egret and little egret specimens, amounting to 9.27 ppm total BHC, 1.9 ppm total DDT, and 0.35 ppm dieldrin in the former, and 2.02 ppm total BHC, 3.1 ppm total DDT, and 2.02 ppm dieldrin in the latter on a wet weight basis. The total BHC in these birds consisted primarily of β-BHC and the total DDT of *p,p'*-DDE. These birds stand high in the food chain.

73-0830. Huang, J.-C. (Dept. of Civil Eng., Univ. of Missouri, Rolla, MO 65401). **Organic pesticides in the aquatic environment.** *Water Sewage Works 118(5): 139-144; 1971.* (35 references)

Several factors affecting the complicated fate of organic pesticides in an aquatic system are reviewed. Volatilization depends primarily on the nature of the compound and to some extent on pH, temperature, and other factors. DDT, dieldrin, and other pesticides are decomposed by UV light; in theory only those molecules of pesticide contained in the upper layer of water will be

affected by this phenomenon. Pesticides differ in their susceptibility to chemical degradation in water, but most organochlorines are stable in the natural aquatic system. Some degradation of chlorinated hydrocarbons has been demonstrated, generally more rapid under anaerobic than under the corresponding aerobic systems. Biological magnification and also simple efficient extraction of organochlorines, as with oysters, explains the high levels accumulated in fish. Data indicates that clay particle adsorption involves the formation of hydrogen bonding or some other form of chemical bonding. Algae appear to have a greater adsorption capacity than clays. Additional information concerning a pesticide's physical, chemical, and biological nature combined with the knowledge of the quantitative effects of the factors mentioned could be of great value in predicting the fate of these chemicals in the aquatic environment.

73-0831. Hoffmann, J.; Eichelsdoerfer, D. (Inst. fuer Wasserchem. und Chemische Balneologie der Techn. Univ. Muenchen, Munich, Germany). **Zur Ozon-Einwirkung auf Pestizide der Chlorkohlenwasserstoff-gruppe im Wasser. [Effects of ozone on organochlorine pesticides in water.]** *Vom Wasser 38: 197-206; 1971.* (7 references) (German)

The reactions of ozone with aldrin, dieldrin, heptachlor, heptachlor epoxide, chlordane, lindane, DDT, and endosulfan were examined in water and *n*-hexane. At an ozone concentration of 240 mg/l., no decrease in dieldrin concentration was observed after 45 min in hexane; slight decreases in DDT, endosulfan I, lindane, and heptachlor epoxide concentrations occurred. About half of the endosulfan II and almost all of the aldrin and heptachlor were converted to other products. Prior to the experiments with aqueous pesticide solutions, the evaporation of the pesticides under the experimental conditions was determined and the results subtracted from the total pesticide loss to determine the true degradation value. Aqueous solutions containing 2 mg/l. of acetone-solubilized pesticide were treated with ozone at 17 or 4 mg/l. for 45 min at room temperature or 10°C. Almost complete (84-100%) degradation of aldrin and heptachlor occurred under these conditions; degradation of other pesticides at the higher concentration and temperature ranged from 0 for lindane and endosulfan I to 78% for DDT; degradation under milder conditions was negligible. Heptachlor was largely transformed into heptachlor epoxide and other complex products. Aldrin was largely oxidized to dieldrin in water. Both of these ozonization products are more toxic than the original pesticides.

73-0832. Mitic-Muzina, N.; Adamovic, V.; Pantovic, D.; Petrovic, O.; Sokic, B. (Inst. for Plant Protection, Belgrade, Yugoslavia) **Prilog proucavanju dinamike degradacije nekih insekticida. I. Dinamika degradacije nekih insekticida koji se koriste za suzbijanje tresnjine muve (*Rhagoletis cerasi* L.; Diptera, Trypetidae). [A contribution to the study of degradation dynamics of some insecticides used for the control of the cherry maggot (*Rhagoletis cerasi* L., Diptera, Trypetidae).]** *Zast. Bilja 22(112-113): 43-51; 1971.* (9 references) (Serbocroatian)

The degradation dynamics of DDT, carbaryl, dimethoate, diazinon, and fenthion in cherries were studied in May and June of 1967 through 1969 in two different climatic regions, Voivodina and Belgrade in Yugoslavia. The insecticides were applied at rates and schedules suited for the control of the cherry maggot (*Rhagoletis cerasi* L.). Diazinon and carbaryl degraded most quickly. When applied in 0.020% concentrations, no traces of diazinon and minimum residues of carbaryl (ranging from 0 to 1.10 ppm) were found in cherry fruits five days after treatment. The breakdown of dimethoate and fenthion was much slower. Amounts of the active ingredients within the tolerance limits (0.5 ppm) could be detected in fruit samples 10 to 15 days after treatment. DDT degraded slowly and residual amounts exceeding the tolerance limit (1.00 ppm in Yugoslavia) were found in cherry samples 20 days after treatment. The differences in the degradation dynamics between the two regions are tabulated and seem related to the amount of precipitation. It is recommended that DDT not be used for control of the cherry maggot.

73-0833. Mitic-Muzina, N.; Adamovic, V.; Pantovic, D.; Petrovic, O.; Sokic, B. (Inst. for Plant Protection, Belgrade, Yugoslavia), **Prilog proucavanju dinamike degradacije nekih insekticida. II. Degradacija nekih insekticida na pludovima breskve i kajsije. [A contribution to the study of the degradation dynamics of some insecticides. II. The degradation of some insecticides on peach and apricot fruits.]** *Zast. Bilja 22(112-113): 51-60; 1971.* (3 references) (Serbocroatian)

Degradation of carbaryl and dimethoate in apricots, and of carbaryl, dimethoate, phosalone, and azinphos in peaches was studied during the summer months of 1968 (apricots) and from 1966 through 1969 (peaches) in two locations in Yugoslavia. The chemicals were applied as required to control the oriental peach moth (*Laspeyrysia molesta* Busk) and the peach borer (*Anarsia lineatella* L.). Degradation of dimethoate in apricots (applied in 0.040% and 0.060%) appeared to be slow; residues decreased below the permissible limit (0.5 ppm in Yugoslavia) in one location after 10 days but were above this limit 15 days after treatment in the other location. Carbaryl residues decreased far below the permissible limit (3.0 ppm in Yugoslavia) 10 days after its application (in 0.075 and 0.100% active ingredient concentrations). The dimethoate residues decreased below the tolerance limit 10 days after application in peaches in both experimental locations. Carbaryl residues decreased below the permissible limit three days

after application in 1968 when an unusual amount of precipitation occurred during the experimental period. Phosalone, applied in 0.05 and 0.07% active ingredient concentrations, decreased below the permissible limit of 2 ppm (Switzerland) during the first days and azinphos, applied in 0.05 and 0.06% concentrations decreased below the 0.5 ppm limit (Netherlands) within 10 to 15 days after application. The degradation dynamics of the above compounds were closely related to the environmental factors and the pharmacological features of these insecticides.

See also 73-0759 73-0853 73-0866 73-0887 73-0909 73-0938 73-1006
73-0852 73-0863 73-0868 73-0893 73-0917 73-0997 73-1008

73-0834. Motabar, M. (School of Pub. Health and Inst. of Pub. Health Res., Univ. of Tehran, Iran). **Observations on the effect on operators and inhabitants following first round spraying with OMS-33 in Jareh, Iran.** *Acta Med. Iran. 14(2): 81-91; 1971.* (3 references)

Spraying of OMS-33 (propoxur) inside all dwellings in 38 villages in Iran resulted in a reported 4.8% incidence of headache or other after effects in inhabitants questioned. Most of these occurred because general instructions were not followed. Sprayers protected by the usual suit, cap, gloves, and surgical mask, experienced symptoms of headache and giddiness and sometimes nausea. No significant differences were observed in the number of cases reported for the sprayers with and without previous exposure to OMS-33. Symptoms of anorexia, diarrhea, and abdominal cramps were observed more frequently in cases of longer exposure and headache was observed less frequently. Nearly all cases were mild and of short duration.

73-0835. Dudley, Jr., A. W.; Thapar, N. T. (518 S.M.I., Pathology, Univ. of Wisconsin, Madison, WI 53706). **Fatal human ingestion of 2,4-D, a common herbicide.** *Arch. Pathol. 94(3): 270-275; 1972.* (29 references)

A 76-yr-old man with senile dementia died six days after ingesting an unknown amount of pure 2,4-D in kerosene. Twenty hr after ingestion the patient was admitted to the hospital in a deep coma. Quinidine sulfate was administered for symptomatic treatment of myotonia and to help prevent cardiac arrhythmia. Ampicillin therapy was initiated on the fourth day when fever appeared. Death was attributed to cardiac arrest following atrial fibrillation. An autopsy revealed cardiac dilation, pulmonary edema, passive congestion of the kidneys, and widespread plaques of acute demyelination in the brain resembling those of acute multiple sclerosis or toxic materials such as arsenic and carbon monoxide. 2,4-D or one of its metabolites may induce demyelination providing an experimental model for the diseases of myelin.

73-0836. Colamussi, V.; Bonari, R.; Benini, F. (Arcispedale S. Anna Di Ferrara, Div. Med. Reumatol. Med. Lavoro, Ferrara, Italy). **Lieve intossicazione da fluoroetanolo (descrizione di tre casi). [Minor poisoning from fluoroethanol. (Presentation of three cases).]** *Arcisp. S. Anna Ferrara 23: 447-458; 1970.* (24 references) (Italian)

Three cases of poisoning with fluoroethanol (a patented rodenticide) occurring by accident in a chemical plant are presented. All patients had tremor, severe muscular asthenia, nausea, headache, and a minor increase in hepatic volume upon palpation–symptoms characteristic of the symptomatology of organofluorine poisoning. Although one patient had hemorrhagic gingivitis and another a prediabetic hyperglycemia, both symptoms could be related to their past history. Clinical and laboratory tests performed on the other 40 workers involved in the activities of the same plant and, presumably, chronically exposed to fluoroethanol but without complaints, revealed normal blood coagulation times and sugar levels. A review of the toxicity of organofluorines, known to act at the tricarboxylic acid cycle level by generating fluoroacetyl coenzyme A is included. No conclusions on the specific features of fluoroethanol toxicity could be drawn.

73-0837. Stagno, S.; Reyes, H.; Rojo, M. (Unidad Pediat., Hosp. Roberto Del Rio, Santiago, Chile). **Intoxicacion por insecticida fosforado. [A case of phosphorus-derived insecticide poisoning.]** *Bol. Chil. Parasitol. 25(1-2): 78-83; 1970.* (23 references) (Spanish)

The case history of severe poisoning in a four year-old girl, developed 6 hours prior to hospitalization, is presented. Clinical symptoms of pallor, sweating, a 140 beats/min pulse rate, 130/90 mm Hg arterial pressure, respiratory difficulties, abundant pharyngeal, nasal, and lacrimal secretion, tachycardia, and bilateral myoclonia of the limbs led to the diagnosis of phosphorus insecticide poisoning. Atropine sulfate administration i.m. (1 mg) reduced the sweating within 20 min. Additional treatment with 0.5 mg atropine 2, 4, and 10 hr later brought about recovery of the patient within 16 hours from the beginning of therapy. The child was discharged in perfect condition 48 hrs after hospitalization. The accident occurred upon drinking water from a Folidol (parathion)-contaminated cup. A review of clinical features and biochemical tests determining the organophosphate poisoning diagnosis and treatment, along with a discussion concerning more attention in handling pesticides, are included.

73-0838. Torre Lopez, E. (Escuela de Medicina, Universidad Autonoma de San Luis Potosi, San Luis Potosi, Mexico). **Inocuidad del DDT? [Safety of DDT?]** *Bol. Of. Sanit. Panamer. 73(2): 163-164; 1972.* (5 references) (Spanish)

The author refutes a claim in a paper by W. J. Hayes Jr. (see Abstract no. 72-1127) on the harmlessness of DDT to the human organism. Although experiments with DDT administered to volunteers and observation of workers involved in the production of DDT indicated it to be harmless, clinical evidence exists that DDT and other insecticides may cause bone marrow alterations leading to aplastic anemia. This disease with a 20-30% mortality was caused by DDT alone or combined with other insecticides in 80% of a 20 patient group. Severe aplastic anemia relapse cases occurred among people reexposed to DDT. It is difficult to prove DDT to be the direct etiological factor of the above disease, but the available clinical data should constitute a warning against its indiscriminate use under both domestic and sanitary campaign conditions.

73-0839. Hayes, Jr., W. J. (Vanderbilt Med. School, Nashville, TN). **Inocuidad del DDT? [Safety of DDT?]** *Bol. Of. Sanit. Panamer. 73(2): 164-165; 1972.* (Spanish)

Referring to the previous paper (73-0838), the author claims the comment and clinical data presented by Torre Lopez are inconsistent. Mortality from aplastic anemia between 1949 and 1967 in the U.S. was constantly 0.4 to 0.5 per 100,000 population despite major DDT use throughout the 1950s. Data on the mortality from aplastic anemia in Mexico is not available, but this disease appears to be much more common there than in the U.S.

73-0840. Anonymous. **Accidental insecticide poisoning.** *Ethiop. Med. J. 9(4): 179-180; 1971.*

Chemicals which through accidental or excessive exposure present an occasional threat to human health are reviewed. The organophosphates are the most potentially dangerous since they are rapidly absorbed through the skin or by ingestion or inhalation. The most toxic include parathion, Tetram, sarin, TEPP, Systox (demeton), and schradan; the least toxic are malathion and dipterex (trichlorfon). Treatment is urgent and consists of washing the skin, inducing vomiting and purgation, artificial respiration and intubation when necessary, and administration of atropine. Pralidoxime may be given as a re-activator of the inhibited ChE. Chlorinated hydrocarbons, including DDT, aldrin, dieldrin, BHC, and chlordane, are less rapidly absorbed and cause a clinical picture similar to strychnine poisoning. Immediate treatment includes washing the skin and clearance of stomach contents. Convulsions may be controlled with short-acting barbiturates. It is recommended that Ethiopian doctors prepare their clinics for an increasing prevalence of accidental poisonings and that the public be clearly warned of the hazards of use of pesticides.

73-0841. Gordon, J. (Haile Sellassie I Univ., Pub. Health Coll., Gondar, Ethiopia). **A case of accidental poisoning.** *Ethiop. Med. J. 9(4): 203-204; 1971.*

A 19-year-old student was hospitalized with loss of consciousness, cyanosis, and pulmonary rales. His pupils were fixed and dilated, the heart rate fluctuated between 40 and 180, blood pressure was 150/110, and severe tonic convulsions occurred at 5-minute intervals. The only indicative factor in the etiology was that on the morning before admission the student sprayed his house for bedbugs using an unknown preparation. Initial therapy comprising phenobarbitone, atropine, and oxygen failed to relieve the convulsions and cyanosis; artificial respiration via endotracheal tube was initiated, and gallamine administered to control convulsions. Subcutaneous administration of atropine at 2 mg/hr was continued. Recovery of consciousness early the next morning was followed by agitation and incontinence of excreta. On the third day symptoms of severe headache, epigastric pain, and generalized muscle pains, as well as a slightly slapping gait remained. He was discharged on the eighth day, symptom-free. The need for preparedness similar situations is emphasized in view of the increasing use of chemical pesticides in Ethiopia.

73-0842. Sellassie, M. A. G.; Lester, F. (Haile Sellassie I Hospital, P.O. Box 257, Addis Ababa, Ethiopia). **Malathion poisoning.** *Ethiop. Med. J. 9(4): 205-206; 1971.*

Malathion was blown into the faces of eight individuals as they opened a case of the powdered insecticide. Two of the men died before reaching a hospital. The other six were admitted with muscular weakness, in some cases pinpoint pupils, drowsiness, a comatose state, altered heart rate and blood pressure, and shallow breathing. They were treated with atropine and endotracheal intubation when necessary and recovered within a maximum of eight days. The need for constant adequate preparation for such emergencies is stressed.

73-0843. Bony, D.; Favarel-Garriques, J.-C.; Cledes, J.; Cambeilh, J.; Castaing, R. (Centre de Reanimation Respiratoire, Bordeaux, France). **Intoxication par le paraquat. [Paraquat poisoning.]** *Eur. J. Toxicol. 4(5): 406-411; 1971.* (21 references) (French)

A 57-year-old man accidentally swallowed about a tablespoonful of a dilute Gramoxone (paraquat) solution; after a few hours he developed ulcerations in the mouth and throat. Four days later, after the ulcerations had become more severe, the patient was hospitalized. Laboratory studies revealed elevated blood urea nitrogen, metabolic acidosis, severe hypoxia, dehydration, oliguria, and subicterus. The blood urea level was reduced by hemodialyses on the 7th and 10th days after the poisoning. After the second hemodialysis, the patient suddenly went into a coma, which was initially reversed by administration of oxygen. Respiration worsened progressively, and the patient finally died of respiratory insufficiency on the 19th day after poisoning, despite efforts at artificial respiration. Autopsy revealed that the normal lung structure had been completely obliterated by consolidation. The altered, granulomatous tissue contained pseudocysts, sometimes fluid-filled. An analysis of 20 cases of paraquat poisoning reported in the literature shows that reversible renal and hepatic insufficiency are generally followed in 4-6 days by the development of lung damage with fatal outcome. Early hemodialysis and possibly corticoid therapy to alleviate lung lesions are among the few possibilities for treatment of paraquat poisoning. Antimitotic and immunosuppressive drug therapy apparently do not increase the chance of recovery.

73-0844. Fenech, F. F.; Grech, J. L. (Royal Univ. of Malta, Malta). **The incidence and pattern of poisoning in Malta.** *Eur. J. Toxicol. 5(3): 208-212; 1972.* (4 references)

An analysis of the incidence and pattern of poisoning in Malta showed that insecticides were responsible for very few of the cases between 1955 and 1969. Five of the 334 adult suicide attempts involved insecticides. Out of 146 accidental adult poisonings, 9 were due to insecticides. In children 67 of the 1,582 observed were poisoned by insecticides. The trend seen in the study was an increase in poisoning by medicinal substances. It was concluded that the closely knit family in Malta is responsible for the relatively low suicide rate.

73-0845. Blekherman, N. A.; Il'yina, V. I. (Inst. Hyg. and Toxicol. of Pesticides, Polymers, and Plastics, Kiev, USSR). **Deyaki pokaznyky hormonal'noy funkstiyi yayechnykiv i kory nadnyrkovykh zaloz u zhinok, yaki pratsyuyut' z klororhanichnymy pestytsydamy. [Some ovarian and adrenal cortex hormonal function indexes in women working with organochlorine pesticides.]** *Fiziol. Zh. (Kiev) 18(2): 268-270; 1972.* (20 references) (Ukrainian)

Daily urinary estrogens and pregnanediol were studied in 30 women (26 of whom were 21 to 40 years old and four women above this age) to detect ovarian function alterations induced by occupational exposure to organochlorines over periods ranging from one to more than 15 years. Eight of these women had had acute polychloropinene, two acute granosan, and one acute hexachlorane (BHC) poisoning in their history. Most of the examined patients complained of headache, lower abdominal pain, and confusion. Determinations were performed during the 7th, 14th, and 21st days of the menstrual cycle and compared to data obtained on a matched group of healthy women. Urinary estrogen levels were high during the initial period of the cycle, decreased during the ovulatory phase (14th day), and were significantly lowered during the luteal phase in the exposed women. No pregnanediol was found in the urine of 27 of these patients during the initial phase of the cycle; the urinary pregnanediol levels were similar to those of the control group during the ovulatory and luteal phases. In studying the androgenic function of the adrenal cortex, no correlations between urinary 17-ketosteroids and menstrual cycle phases were ascertained in either of the above groups. However, the individual daily urinary 17-ketosteroid levels varied from 7.2 to 14.5 mg in healthy and from 3.5 to 9.7 mg in the pesticide-handling women, indicating an impairment of the adrenal cortex. Exposure to organochlorines appears to cause considerable hormonal alterations of the ovary and adrenals.

73-0846. Salikhodzhayev, S. S.; Fershtat, V. N. (Uzbek Sci. Res. Inst. Sanit., Hyg. Occup. Diseases, Tashkent, USSR). **Sostoyaniye obonyatel'nogo analizatora pri vozdeystvii khlor- i forsfororganicheskikh pestitsidov. [The condition of the olfactory analyzer as affected by organochlorine and organophosphorus pesticides.]** *Gig. Sanit. 37(9): 95-96; 1972.* (4 references) (Russian)

The condition of the olfactory analyzer was studied in 330 subjects who have been in contact with organochlorine and organophosphorus pesticides occupationally for various periods of time. Lesions of the upper respiratory tract appeared in 56%, hyposmia in 65.7% and increased odor identification threshold in 55.5%. Lesions of the central areas of the olfactory analyzer in 35.8% may be presumed. The changes in the acuteness of the sense of smell were most frequent and most pronounced among subjects with symptoms of pesticide poisoning as well as in those having had prolonged occupational contact.

73-0847. Savage, E. P.; Tessari, J. D.; Couture, L. P. (Inst. of Rural Environ. Health, Dept. of Microbiol., College of Vet. Med. and Biomed. Sci., Colorado State Univ., Ft. Collins, CO 80521). **Pesticides sold in grocery stores are potential health hazards.** *HSMHA (Health Serv. Ment. Health Admin.) Health Rep. 87(8): 734-736; 1972.*

A study of the potential public health hazard of pesticides was conducted in 29 supermarkets and grocery stores in northern Colorado. In 24% of the stores pesticides were located within 10 feet of fruit displays. Practically all were within easy reach of children. Few stores handled pesticides with the poison classification, but 62% of caution-labeled products observed were displayed less than one foot from the floor. Botanicals were sold in two-thirds of the stores and organochlorines were sold in slightly less. One out of three stores handled organophosphates, carbamates, and heavy metals. About one third of the stores handling dichlorvos strips had products with both the old and the revised label. Pesticides and foods were received in the same room in 70% of the stores, but most of the stores packaged the products separately at the checkout counter. If it is not feasible to prohibit the sale of pesticides in grocery stores, managers should be trained to isolate the pesticides from fresh food products to avoid contamination. This does not solve the problem of contamination by airborne particles.

73-0848. Schlicher, J. E.; Beat, V. B. (Dept. of Dermatol., Univ. of Iowa College of Med., Iowa City, IA). **Dermatitis resulting from herbicide use—a case study.** *J. Iowa Med. Soc. 62: 419-420; 1972.*

A farmer with a history of sensitivity to Ramrod (propachlor) herbicide was treated for acute contact dermatitis of the hands and forearms after he sprayed atrazine, cleaning the nozzles without protection, and Bladex. Treatment consisted of giving codeine and prednisone and soaking hands in 1/4% acetic acid. Tetra-

cycline was adminstered prophylactically. The hands and forearms were 90% healed in 28 days.

73-0849. Rathus, E. M. (Dept. of Health, Brisbane, Australia). **The effect of pesticide residues on humans.** *Med. J. Aust. 1(21): 1098-1100; 1972.* (11 references)

The problem of pesticide toxicity in humans has two aspects: the acute threat present in cases of accidental or intentional intake of large doses and the chronic problem created by daily low-level exposure, mainly through foodstuffs. Massive disease control programs, which afford an opportunity for studying the effects of low-dose exposure, have resulted in no overt deleterious effects in persons not symptomatically affected. Occupational exposure has been most hazardous with organophosphates. Long-term studies of low-dosage exposure to DDT and dieldrin have shown no clinical or laboratory evidence of illness. Careful analysis of claims that DDT is involved in diseases like leukemia and Hodgkin's disease has revealed no significant relationships. The beneficial effects of pesticides, coupled with the little evidence of detrimental effects of residual levels, suggest that their use should be continued while the search goes on for better, safer compounds.

73-0850. Switzer, B. C.; Wolfe, F. H.; Lewin, V. (Dept. of Food Sci., Univ. of Alberta, Edmonton, Alberta, Canada). **Eggshell thinning and DDE.** *Nature (London) 240(5377): 162-163; 1972.* (5 references)

A Letter-to-the-Editor disputes the claim that eggshell thinning in brown pelicans is directly related to DDE residues (see Abstract no. 72-0972). The statistical correlation used to show a cause and effect relationship was obtained by grouping unrelated populations and subspecies, and no evidence was presented to eliminate the many other factors which could explain the differences between species, times, and populations. A bias may have been inherent in the museum and oologist collections in the years before 1947, favoring larger, thicker, unfractured eggs. Evidence from earlier experimental studies used to support the conclusion that DDE is responsible for eggshell thinning is rejected since some control birds in the study under consideration had thinner shells than the DDE-treated birds.

73-0851. Wiemeyer, S. N.; Porter, R. D. (Fish and Wildl. Serv., Bureau of Sport Fisheries and Wildl., Patuxent Wildl. Res. Cent., Laurel, MD 20810). **Eggshell thinning and DDE.** *Nature (London) 240(5377): 163; 1972.* (6 references)

In a reply to a Letter-to-the-Editor (see abstract no. 73-0850), the authors deny that their conclusions are invalidated by the overlapping eggshell thickness values in DDE-dosed and control hawks. These conclusions were drawn on the basis of statistical calculations, means and standard errors, which are accepted criteria for data evaluation. The experimental design also entailed evaluation of changes in eggshell thickness of individual birds from year to year; a distinct decline in shell thickness was seen over the treatment period. Evidence correlating eggshell thickness and DDE residues in wild birds is indeed conflicting, but several apparently reliable references show that DDE residues in wild hawks are comparable to those in the DDE-treated hawks of the referenced study.

73-0852. Risebrough, R. W. (Bodega Marine Lab., Univ. of California at Berkeley, Bodega Bay, CA 94923). **Reply to Hazeltine.** *Nature (London) 240(5377): 164; 1972.* (2 references)

A Letter-to-the-Editor replying to a previous letter by Hazeltine (see Abstract No. 73-0377) criticizes Hazeltine for failing to practice what he advocates, the consideration and presentation of all relevant data. Part of Hazeltine's argument against the conclusions of Blus et al. with regard to brown pelican eggs and eggshell thinning (see Abstract nos. 72-0972 and 72-0329) was based on unpublished data from the California Department of Fish and Game (CDFG); however, the full extent and thrust of this data were not mentioned. Values described by Hazeltine as whole egg DDE residues were actually reported by CDFG as yolk DDE residues, invalidating Hazeltine's inference that whole-egg residues of DDE decrease ten-fold during incubation. Residue and shell thickness trends within a given pelican colony might differ from those within the overall collective without invalidating the correlations since the sample sizes of individual colonies are small. Blus's analysis of variance gave a regression coefficient between DDE contents and eggshell thickness which was significantly different from zero although the drawing in Blus's paper was only approximate. The applicability of Pearson's product moment correlation to the given set of data is defended.

73-0853. Blus, L. J.; Gish, C. D.; Belisle, A. A.; Prouty, R. M. (U.S. Bureau of Sport Fish. and Wildl., Patuxent Res. Cent., Laurel, MD 20810). **Further analysis of the logarithmic relationship of DDE residues to eggshell thinning.** *Nature (London) 240(5377): 164-166; 1972.* (21 references)

A Letter-to-the-Editor offers further rebuttal of Hazeltine's criticism (see Abstract no. 73-0377). Data on eggshell thickness and DDE residues in brown pelican colonies from four states are presented to illustrate the point that significant regressions may not be obtained for a single colony or state due to the appreciable similarity in residues within a given area. This need not invalidate the relationships observed when the different populations are considered together. The origin of the misinterpretation concerning metabolism of DDE during incubation is explained. In reply to the letter of Switzer

et al. (see Abstract no. 73-0850), the authors state that they claimed a cause-and-effect relationship between DDE and eggshell thinning on the basis of experimental data from other authors, not on the basis of their own findings in the field. The wild pelican data are said to come as near to a perfect field relationship between a pollutant and an adverse biological effect as can be expected. A brief note from Hazeltine withdraws his statements on ten-fold lipid and DDE residue decline with incubation while maintaining that the increasing lipid basis DDE residue correlation to increasing shell thickness is still valid.

73-0854. Tsunenari, S.; Ogata, Y.; Matsumoto, S.; Abe, Y.; Kanda, M. (Kumamoto University, Japan). **[A death by intoxication due to Azomite, an acaricide, and experimental studies on the acaricide.]** *Nippon Hoigaku Zasshi (Jap. J. Leg. Med.) 26(5): 381; 1972.* (Japanese)

A boy of 19 attempted suicide by swallowing about 50 ml (about 1 mg/kg body weight) of a new acaricide formulation, Azomite (consisting of 38% of azoxybenzene, 22% of PPPS, 2-[2-(*p-tert*-butylphenoxy)-1-methylethoxy]-1-methylethyl-1-chloroethyl sulfite, and 40% of xylene). Clinically, the symptoms were slight at first. Seventy-two hours after intake, jaundice began to appear; the patient fell into hepatic coma 111 hours after intake and died of heart failure 140 hours after intake. The case was clinically diagnosed as toxic hepatitis developing into extensive hepatic necrosis. Autopsy could not be carried out so experiments were done with mice. Azomite showed a relatively low acute p.o. toxicity, LD50 being 3089 mg/kg. In the cases of early death of the animal, the tissues showed only congestion and hemorrhage; in cases of later death (5-6 days after the intake) the destruction of Glisson's capsule cells was conspicuous and accompanied by infiltration of inflammatory cells and hemorrhages of the lung and stomach.

73-0855. Uetake, S.; Yamada, K.; Seta, K.; Shirokura, T.; Maekawa, T.; Shigitani, R.; Ogura, H.; Satane, B.; Toyoda, O. (2nd School of Intern. Med., Fac. of Med., Gumma Univ., Maebashi, Japan). **[A case of Gramoxone intoxication.]** *Nippon Naika Gakkai Zasshi (J. Jap. Soc. Intern. Med.) 61(11): 1435-1436; 1972.* (Japanese)

A twenty-year-old woman attempted suicide by swallowing 2.5 mouthfuls of an aqueous solution containing a few drops of a paraquat dichloride formulation (24% a. i.) and some eye drops in about 150 ml of water. She felt transient palpitations without any changes in general condition; however, after 20 days a white coat covered her tongue and she was hospitalized complaining of pharyngalgia and hoarseness. Unusual findings on examination were the increases in WBC and BUN, positive response in occult blood test on feces, erosion of the front half of the tongue, and a slight increase in GOT and GPT. Administration of dexamethasone was started immediately. After two weeks, erythema appeared on the face, the upper extremities, and the trunk, with spots elevated slightly from the skin and of various sizes up to a diameter of 10 mm. The erythema disappeared slowly, and BUN, GOT, and GPT became normal in a short time. The patient was released after 40 days completely recovered. In another case a patient was hospitalized after swallowing up to 15 ml of the paraquat dichloride formulation. Increase of BUN, GOT, and GPT was also recognized, and exanthemata appeared on the face and upper extremities 10 days after paraquat ingestion. The patient died after one month's hospitalization with abdominal pain, jaundice, high temperature, and dyspnea. Although the difference of intake of the a. i. in the two cases was quite large, the symptoms in the two cases were quite similar.

73-0856. Kudo, N. (Kudo Hospital of Intern. Med., Hirosaki, Japan). **[Studies on the pathological physiology of intoxication by agricultural chemicals. III. Relations between glutathione and intoxication by organophosphorus pesticides.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(3): 329-339; 1972.* (15 references) (Japanese)

A study was carried out on the role of glutathione during intoxication by organophosphorus pesticides, especially by parathion, and on the mechanism of glutathione in human blood, clinically and also experimentally. The value of total glutathione in blood was 40.80 ± 2.09 mg/dl in healthy persons, 37.80 ± 1.26 mg/dl in patients of acute intoxication by parathion, and 38.70 ± 1.26 mg/dl in patients diagnosed with chronic intoxication caused by organophosphorus pesticides. Treatment of acute parathion intoxication with glutathione at the dose rate of 600 mg/day, for two days i.v., conspicuously increased serum ChE activity. Treatment of chronic parathion intoxication with glutathione at the rate of 300 mg/day for four weeks p.o. was highly effective in recovering serum ChE activity. By studying the mechanism of action of administered glutathione in parathion intoxication, it was found that total glutathione in blood and serum ChE activity changed relatively quickly after i.v. administration; however, total glutathione in blood did not show any change until 2 hr after p.o. administration of glutathione. It is thought that the glutathione taken into blood is taken up by the cellular elements, especially into erythrocytes, and it is estimated that the orally administered glutathione translocates into erythrocytes after 72 hr. It was found that the amount of glutathione in plasma was 7-9% of the total amount of glutathione in the blood of healthy persons. No clear relationship was found between the amount of glutathione in erythrocytes and erythrocyte ChE activity.

73-0857. Kudo, N. (Kudo Hosp. of Intern. Med., Hirosaki, Japan). **[Studies on the pathological physiology of**

intoxication by agricultural chemicals. IV. Clinical investigations on chronic intoxication by organophosphorus pesticides.] *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(3): 340-351; 1972.* (27 references) (Japanese)

Clinical examinations were performed on 22 rural dwellers, previouslv diagnosed as victims of chronic organophosphate poisoning, from the apple-growing regions of Aomori Prefecture. The group included men and women, 30-65 years of age, who had been using organophosphates for 10-15 yr, mostly on their own farms rather than as part of cooperative groups. Half of the patients were asymptomatic; 18% reported fatigue or angina pectoris-like symptoms, and 5% reported dizziness or other symptoms. The serum ChE level was below 0.60 Δ pH in 68% and below 0.68 Δ pH in 91%. Pathological liver function test results were recorded in 20%. Total serum protein was normal in all cases, but the albumin/globulin ratio was elevated in 77%, and the α_1-globulin was depressed in 82%. Blood glutathione was slightly depressed in the majority of cases. Treatment of five cases of chronic parathion poisoning with glutathione perorally, 300 mg/day for four weeks, was effective in restoring serum ChE activity. A systematic procedure was developed for the detection of chronic organophosphate poisoning cases (including the examination of case histories) and the analysis of serum, red cell, and total blood ChE.

73-0858. Friedrich, Jr., E. G. (Dept. of Gynecol. and Obstetrics, The Med. College of Wisconsin, Milwaukee, WI 53226). **Vulvar carcinoma in situ in identical twins—an occupational hazard.** *Obstet. Gynecol. 39(6): 837-841; 1972.* (13 references)

Case histories are reported for female identical twins who spent considerable time on separate farms in their youth spreading what was most likely a mixture of calcium and potassium arsenite to control the potato beetle. They developed vulvar carcinoma in situ. The vulvae came into contact with unwashed hands and pesticide covered vegetation frequently since most of the farming was done by hand and field toilets were not available. Both had been treated surgically numerous times for "warts" on the dorsal surface of the hands, compatible with arsenical keratoses. Hereditary predisposition, chronic exposure to pentavalent arsenicals, and local site irritation caused by rubbing or wiping the vulvar area with a caustic compound all apparently contributed to the cases described.

73-0859. Borredon, J. J. (Author address not given). **L'aeronautique agricole et sa pathologie. [Agricultural aeronautics and its pathology.]** *Presse Therm. Clim. 108(4): 239-243; 1971.* (20 references) (French)

Poisoning hazards involved in agricultural aeronautics and symptoms of various pesticide poisonings are reviewed. Organochlorine and organophosphorus pesticides, thiocarbamates, triazines, copper and arsenic compounds, sulfur, nitro compounds, herbicides (especially cyanamides, phytohormones, and urea derived compounds), defoliants, and desiccants are distributed from aircraft. Aerosols of such pesticides may cause poisoning of crews and other persons during application. Lipid-soluble organochlorine pesticides first attack the nervous system and cause seizures, pains, sensory disturbances, mydriasis, and possibly coma. Organophosphate pesticides, known to be cholinesterase inhibitors, may cause glandular hypersecretion, salivation, rhinorrhea, diarrhea, bronchioalveolar edema, bradycardia, miosis, muscular fasciculation, epileptiform convulsions, coma, and respiratory difficulty. Thiocarbamates produce neural and digestive symptoms, while digestive disturbances, mucous hypersecretion, sialorrhea, coryza, cardiac and renal disorders, and polyneuritis are symptoms of arsenic poisoning. Phytohormones are of low toxicity, but may produce myocardial disturbances and atrial fibrillation. Highly toxic nitro compounds cause cyanosis, as well as digestive and neural affections. Triazines, while hardly toxic for man, cause cutaneous allergies.

73-0860. Klemmer, H. W. (Pacific Biomed. Res. Center, Univ. of Hawaii, Honolulu, HI). **Human health and pesticides—Community Pesticide Studies.** *Residue Rev. 41: 55-63; 1972.* (13 references)

Thirteen state Community Pesticide Studies, funded by the Office of Pesticides, Environmental Protection Agency, are carrying out research to determine long-term and short-term effects of pesticides on human health. Common goals and study methods provide the capability for legitimate comparisons of data from different states, each with some unique features of pesticide use and exposure. Five years of research by the Hawaii Project are briefly reviewed. A high rate of pesticide use is noted for both rural and urban areas of the state. In a random survey in the City and County of Honolulu, usage of pesticides in homes correlated positively with sinus trouble, asthma, and bronchitis. Occupational usage of pesticides has been extensively studied. In one study different types and degrees of exposure have been correlated with different parameters of health in more than 300 volunteer participants. Levels of common organochlorine residues and of pentachlorophenol in the serum of these individuals correlated with occupational exposure class, with enzyme and protein components of the serum, and with other clinical parameters. Detailed results will be published separately. (Author abstract by permission)

73-0861. Dabija, G.; Avram, S. (Pasteur Inst. of Vet. Med. and Biol. Prep. Res., Bucharest, Rumania). **Insecticidele organo-fosforice folosite in agricultura si influenta lor asupra sanatatii animalelor. [Organophosphate**

insecticides used in agriculture and their influence on the health of livestock]. *Rev. Zooteh. Med. Vet. 22(2): 78-83; 1972.* (Rumanian)

A review of the organophosphate (OP) insecticides used in agriculture is presented. Discussed are factors affecting their toxicity (structure-effect relationships, molecular weight, aggregation state, electrolytic dissociation, concentration, routes of penetration, and individual susceptibility) along with symptomatology, diagnosis, and treatment of affected animals. Lethal doses of different OP compounds determined in laboratory animals are compared to those for sheep and cattle. The involvement of cholinesterase in terms of pseudocholinesterase (serum) and "true" tissue cholinesterase (liver) as the main target of OP toxicity is analyzed. Recommended antidote treatment includes atropine sulfate combined with pralidoxime or other oximes such as toxogonin (obidoxime). Propaphenine (chlorpromazine), combelen (propionyl promazine), and Romthiazine (dimethylaminopropyl phenothiazine maleate) are suggested for the treatment of nicotinic phenomena. Antibiotics are recommended as supportive treatment for the prevention of pulmonary complications. Trichlorfon, carbetox, crufomate, dichlorvos, bromophos, and other, OPs with low toxicity for livestock are recommended for agricultural use. Animals should not be allowed to enter the stable for 12 hr after insecticide spraying; plants intended as animal fodder should not be harvested until 15 to 30 days after spraying with OP.

73-0862. Cinotti, V. (M. Mujbegovic Gen. Hosp., Dept. Otorhinolaryngology, Tuzla, Yugoslavia). **Trovanja Radosanom i Gamacidom izazvala vertiginozne smetnje. [Poisoning with Radosan and Gamacid caused vertiginous disorders.]** *Srp. Arh. Celok. Lek. 98(9-10): 1213-1217; 1971.* (16 references) (Serbocroatian)

Vestibular disorders caused by Radosan (a preparation containing 1.5% of organically bound mercury) in two agricultural workers while handling dusted wheat, and by Gamacid (a BHC solution containing 10% lindane) are described. The latter case involved an elderly woman who had ingested pickled peppers taken from a Gamacid-treated barrel. Symptoms included nystagmus of the first, second, and third degree, vomiting, nausea, vertigo, and ringing in the ears, observed in all three cases. Torecan (thiethylperazine), administered p.o. (1 tablet, three times daily), in the first and third case, and treatment with diligan, in the second case, provided full recovery of the patients within three days.

73-0863. Koeman, J. H.; Beusekom, C. F. van; deGoeij, J. J. M. (Inst. of Vet. Pharmacol. and Toxicol., Utrecht, The Netherlands). **Eggshell and population changes in the sparrow-hawk (*Accipiter nisus*).** *TNO-Nieuws 27(10): 542-550; 1972.* (40 references)

Unhatched sparrowhawk eggs collected between 1969 and 1971 in the eastern regions of The Netherlands contained hexachlorobenzene (HCB), polychlorinated biphenyls (PCBs), DDE, and mercury. No great variation was found between values for each year or for different localities. Mean levels in 1971 for DDE and PCB, the most prevalent residues, were 26 ppm and 47 ppm, respectively; a positive correlation was obtained between DDE and PCB levels. In comparing eggs from 1960-1971 with those obtained by museums before 1945, the average decline in egg-shell index was 10.6%. No correlation was found between the concentration of any compound in the eggs and shell index or thickness. However, on the basis of studies reported in the literature, DDE and possibly mercury were responsible for the declines. Reproductive success measured in this investigation was approximately 25% lower than in the period from 1931-1943. Predation and interference by man accounted for only about 10% of the failures.

73-0864. Rooth, J.; Jonkers, D. A. (Res. Inst. for Nature Manage., TNO, The Netherlands). **The status of some piscivorous birds in The Netherlands.** *TNO-Nieuws 27(10): 551-555; 1972.* (12 references)

A definite relation existed between the decline of some piscivorous bird species and environmental pollution. Acute poisoning by polychlorinated biphenyls, general water pollution, destruction of nests by fishermen, and a decline in nesting areas have affected the cormorant population. The pollution of food areas and poisoning by organochlorines are considered the main causes of the demise of the spoonbill and the sandwich tern. Some species have been affected by a shortage of food caused by water pollution; others appear to be increasing slightly in numbers.

73-0865. Swennen, C. (Nederlands Inst. voor Onderzock der Zee, TNO, The Netherlands). **Chlorinated hydrocarbons attacked the Eider population in The Netherlands.** *TNO-Nieuws 27(10): 556-560; 1972.* (8 references)

A drop in the number of nests of eider ducks on the islands in Wadden Sea in The Netherlands occurred when dieldrin and Telodrin (isobenzan) were being used. Some recovery of the population has been observed since the discontinuation of use of these compounds. In 1966 only 30% of the nearly 6,000 nests present in 1960 were counted. The loss was most severe in the westernmost breeding grounds and closest to the North Sea into which organochlorines drained from the Rhine.

73-0866. Braaksma, S.; Drift, van der, J. W. P. T. (State Forest Service, Utrecht, The Netherlands). **Bats-pesticide conflicts.** *TNO-Nieuws 27(10): 579-583; 1972.* (15 references)

A survey of bat populations in old buildings in The

Netherlands has shown that the numbers of various species of bats are rapidly decreasing. No precise information on the role of agricultural pesticide use in this decline is available for The Netherlands, but consumption of poisoned insects and a decreased supply of insects for food could be responsible. The primary cause of the decline of the guano bats in the United States was attributed to DDT. The poisonous effects of wood preservation insecticides and fungicides on bats have been observed in a number of churches in The Netherlands. Dieldrin and lindane were detected in dead bats collected from the churches. At present a bat specialist advises those planning to treat an old building to spray while the bats are away or to remove them during treatment. B-dihydroheptachlor is being investigated as a less toxic chemical for wood preservation.

73-0867. Lieshout, van, C. G.; Hoskam, E. G. (Cent. Vet. Inst., Rotterdam, The Netherlands). **Incidental mortality of wild birds resulting from abusive applications of pesticides.** *TNO-Nieuws 27(10): 589-593; 1972.* (5 references)

Cases of mortality in wild birds due to accidental or intentional poisoning by pesticides and other toxic chemicals were studied over the period since 1950 in The Netherlands. Poisoning was attributed to parathion and other organophosphates, elemental phosphorus and zinc phosphide, metals, and cyanides. Between 1969 and 1972, 57 cases of reported mortality were due to poisoning while only 11 could be attributed to other causes. The incidence of cases appears to be evenly distributed across the country. Recently 75% of all poisonings were due to illegal use of parathion-treated seeds, apparently strewn to kill birds and prevent picking of crops. Better laws regarding pesticide use and strict enforcement are needed to prevent such poisonings.

73-0868. Locke, D. O.; Havey, K. (Maine Dept. of Inland Fish. and Game, Augusta, ME 04330). **Effects of DDT upon salmon from Schoodic Lake, Maine.** *Trans. Amer. Fish. Soc. 101(4): 638-643; 1972.* (9 references)

Eggs stripped from salmon from Schoodic Lake in a blueberry growing area of Maine had a 66% mortality when observed under controlled conditions to the feeding stage, compared to a 30% mortality among control salmon eggs. Significantly higher levels of DDE, TDE, total DDT, dieldrin, and BHC were found in Schoodic Lake compared to the lake from which control eggs were obtained. Total DDT in salmon eggs and fry from Schoodic Lake ranged from 7.21 to 10.41 ppm as opposed to 0.28 to 1.31 ppm in control fish. Dieldrin levels were also significantly higher in Schoodic Lake fish. Guthion (azinphosmethyl) levels in the fish ranged from 0.12 to 0.5 ppm, but the assay was not specific and could have given incorrect results. It is possible that guthion, dieldrin, and other pesticides may have a detrimental synergistic effect with DDT on fish.

See also **73-0758** **73-0761** **73-0797** **73-0806** **73-0817** **73-0825**

73-0869. Luton, J. P.; Valcke, J. C.; Remy, J. M.; Mathieu de Fossey, B.; Bricaire, H. (Cent. de Rech. Endocrinol., Hopital Cochin, Paris, France). **Gynecomasties au cours de traitements prolonges de la maladie de Cushing par l' *o,p'*-DDD. [Gynecomastia after long-term treatment of Cushing's disease with *o,p'*-DDD.]** *Ann. Endocrinol. 33(3): 290-293; 1972.* (3 references) (French)

Two males out of 16 patients with Cushing's disease who were treated with *o,p'*-DDD (TDE) developed gynecomastia in the fourth month of the therapy. The gynecomastia was accompanied by a very high urine estrogen level which normalized after *o,p'*–DDD therapy was stopped. Some of the hypotheses concerning the action mechanism of *o,p'*-DDD in gynecomastia with elevated estrogen level are modification of hormone synthesis, insufficient hepatic inactivation of estrogen, and direct action on hepatic enzymes, stimulating the estrogen production. While *o,p'*-DDD may be a possible factor involved in the development of gynecomastia, its action mechanism remains uncertain.

73-0870. Weinberger, M.; Bollag, J. M. (Lab. of Soil Microbiol., Dept. of Agron., Pennsylvania State Univ., University Park, PA 16802). **Degradation of chlorbromuron and related compounds by the fungus *Rhizoctonia solani*.** *Appl. Microbiol. 24(5): 750-754; 1972.* (8 references)

The ability of the soil fungus *Rhizoctonia solani* to degrade phenyl-substituted urea herbicides was investigated. The fungus was able to transform chlorbromuron [3-(3-chloro-4-bromophenyl)-1-methyl-1-methoxyurea] to the demethylated product [3-(3-chloro-4-bromophenyl)-1-methoxyurea], which was isolated and identified. Evidence was obtained that further degradation of chlorbromuron occurred. Several other phenylurea compounds (chloroxuron, diuron, fenuron, fluometuron, linuron, metobromuron, neburon, and siduron) were also metabolized by the fungus, indicating that *R. solani* may possess a generalized ability to attack this group of herbicides. (Author abstract by permission)

73-0871. Pantelic-Vukovic, D.; Stevanovic, M. (Author address not given). **Uticaj organofosfornih otrova na kolicinu acetilholina i aktivnost holinesteraze mozga pacova. [The action of organophosphate poisons on the acetylcholine levels and cholinesterase activity in rat brain.]** *Arh. Farm. 21(4): 225-228; 1971.* (10 references) (Serbocroatian)

Adult female rats were dosed s.c. with equitoxic amounts (1LD50) of methylethoxyphosphoryl choline (compound I), a non-liposoluble OP, and with pinacolyloxymethylphosphoryl fluoride (soman), a liposoluble compound, to study their effects on brain and whole blood acetylcholine levels and cholinesterase activities. Acetylcholine increased 35%, brain cholinesterase activity decreased 90%, and whole blood cholinesterase activity decreased 83% thirty minutes after soman administration. Compound I caused a whole blood cholinesterase decrease by 73% and no effects on any of the above parameters in the brain. In another experiment soman administered to rats at rates of 0.25, 0.50, or 0.75 LD50 decreased brain cholinesterase activity by 5, 80, and 90% and inhibited blood cholinesterase by 45, 75, and 82%, respectively. Brain acetylcholine levels increased by 0, 10, and 20%, respectively. The different partition coefficients of the two compounds between the aqueous and lipid phases seem to determine the difference in their effects.

73-0872. Schnitzerling, H. J.; Roulston, W. J.; Stone, B. F.; Wilson, J. T.; Thompson, P. G. (Div. of Entomol., SCIRO, Long Pocket Lab., Private Bag No. 3, P.O., Indooroopilly, Queensland, 4068, Australia). **The rate of loss of DDT on cattle in relation to protection from reinfestation by the cattle tick *Boophilus microplus*.** *Aust. J. Agr. Res. 23(4): 735-744; 1972.* (12 references)

A cyclic change was observed in DDT loss rate (highest in summer and lowest in winter) on cattle sprayed with 0.5% w/v DDT 31 times at 4-wk intervals. Concurrent investigations of the protective period on the flank, escutcheon, and barrel indicated that the rate of DDT loss was in antiphase with corresponding changes in the protective period. The magnitude of change was greater on the flank than on either the barrel or the escutcheon. The rate of loss was greatest on the flank, less on the escutcheon, and least on the barrel.

73-0873. Weeks, R. E.; Hedrick, H. G. (Louisiana Tech. Univ., Ruston, LA 71270). **Screening microorganisms from two soils for utilization of the systemic fungicide Benlate.** *Bacteriol. Proc. 71: 14; 1971.*

Achromobacter were the most active of the soil microorganisms tested for bacterial utilization of the systemic fungicide, Benlate, and its active ingredient, benomyl. After seven days' incubation with species of *Achromobacter*, only 20% of the Benlate activity remained. Oxygen uptake by bacterial isolates from potting soil was greater when Benlate was added; in experiments with these isolates using a chemically defined medium, uptake was lower. Oxygen uptake was greater with an orchard soil isolate when Benlate was present; however, Benlate appeared to be inhibitory when added 1 hr after the start of incubation. The results indicate that in soils where Benlate is applied, some detoxication will take place. (Abstract A78)

73-0874. Roslycky, E. B. (Res. Inst., Canada Agr., London 72, Ontario, Canada). **Influence of selected herbicides on soil microflora.** *Bacteriol. Proc. 71: 14, 1971.*

Treatment of Fox sandy loam under peach trees with paraquat alone or in combination with simazine,

atrazine, diuron, linuron, or simazine plus diuron for seven years resulted in changes in the microbial profile. These changes were established by comparing physiological activity of 100 randomly chosen bacterial isolates with respect to utilization of certain carbohydrate, nitrogenous, sulfurous, and lipid materials. Cellulose-, starch-, and pectin-hydrolyzing bacteria were affected by the herbicides while no differences were observed when utilization of monosaccharides was tested. Some differences were found among treatments with respect to proteolysis, NO_3^- utilization and conversion, production of hydrogen sulfide, and lipolysis. (Abstract A79)

73-0875. Focht, D. D. (Dept. of Soil Sci. and Agr. Eng., Univ. of California, Riverside, CA). **Mixed culture degradation of DDT metabolites.** *Bacteriol. Proc. 71: 15; 1971.*

Degradation products of DDT, dichlorodiphenylmethane (DDM) and *p*-chlorophenylacetic acid (*p*CA), can be broken down under proper conditions to carbon dioxide, water, and HCl. A *Hydrogenomonas* isolated from a culture containing diphenylmethane (DPM) as the sole carbon source grew on chlorosuccinic, 3-chlorobutyric, and 4-chlorobutyric acids, releasing chloride; it was unable to grow with either *cis* or *trans* 3-chlorocrotonic acid as sole carbon source or to dechlorinate the ring fission products formed from cometabolism of *p*-chlorophenylacetic acid and dichlorodiphenylmethane (DDM). Washed fungal suspensions grown from *cis*-3-chlorocrotonic acid dechlorinated both ring fission products. After inoculation of sterile medium containing DPM and DDM with the bacterium and the fungus, bacterial growth was limited solely by the amount of DPM and fungal growth was limited solely by the amount of DDM cometabolized by the bacterium. Fungal growth was increased by adding *cis*-crotonic acid and decreasing the amount of DPM in the medium. (Abstract A92)

73-0876. Bordeleau, L. M.; Bartha, R. (Rutgers Univ., New Brunswick, NJ). **Peroxidatic condensation of chloroanilines.** *Bacteriol. Proc. 71: 15; 1971.*

High-peroxidase producing soil microorganisms, including a *Geotrichum candidum* transformed pesticide-derived chloroanilines to chloroazobenzenes. When stoichiometric concentrations of peroxidase, hydrogen peroxide, and 3,4-dichloroaniline were reacted in an accelerated flow apparatus, a free radical was generated which caused the trapping agent 2-(*t*-butyl)-4-methylphenol to form a dimer. The exclusive production of this compound supported the involvement of 3,4-dichloroanilidyl as the initiator of the dimerization. The intermediate 3,4-dichlorophenylhydroxylamine was also identified. The results support the pathway of peroxidation of 3,4-dichloroaniline to 3,4-dichloranilidyl, which in aqueous solution goes to 3,4-dichlorophenylhydroxylamine. Condensation of this product yields 3,3′,4,4′-tetrachloroazobenzene. (Abstract A93)

73-0877. Bollag, J. M.; Liu, S. Y. (Pennsylvania State Univ., University Park, PA). **Fungal transformation of the insecticide carbaryl.** *Bacteriol. Proc. 71: 15; 1971.*

Carbaryl was metabolized by several soil fungi and its metabolic products isolated by TLC. Three metabolites were identified as 1-naphthyl *N*-hydroxymethylcarbamate, 4-hydroxy-1-naphthyl methylcarbamate, and 5-hydroxy-1-naphthyl methylcarbamate, indicating that the *N*-alkyl- and aromatic ring-hydroxylation of carbaryl are important detoxication reactions of the fungi studied, which included *Aspergillus, Fusarium, Gliocladium, Mucor, Penicillium* and *Rhizopus*. There were indications that the hydroxylated metabolites could be further degraded. (Abstract A94)

73-0878. Pfaender, F. K.; Alexander, M. (Cornell Univ., Ithaca, NY). **DDT co-metabolism in vitro and in vivo.** *Bacteriol. Proc. 71: 15; 1971.*

Principal products formed when DDT was incubated anaerobically with resting cell suspensions or cell-free preparations of *Hydrogenomonas* sp. included TDE, DDE, DBP (dichlorobenzophenone), and 1-chloro-2,2-bis(*p*-chlorophenyl)ethane. Addition of both fresh resting cells and oxygen to the reaction mixture resulted in the synthesis of *p*-chlorophenylacetic acid, demonstrating cleavage of a DDT ring by a single organism. TDE, DDE, DBP, and small quantities of other products were generated from natural microbial communities of freshwater sediments and sewage, the latter being more active. The sewage bacteria degraded DDT to *p*-chlorophenylacetic acid; pure isolates of these bacteria utilized *p*-chlorophenylacetic acid as a carbon source. (Abstract A95)

73-0879. Horvath, R. S. (Dept. of Biol., Bowling Green State Univ., Bowling Green, OH 43403). **Microbial co-metabolism and the degradation of organic compounds in nature.** *Bacteriol. Rev. 36(2): 146-155; 1972.* (58 references)

The degradation of organic compounds such as pesticides in nature can be accomplished by microbial cometabolism, the oxidation of substances without utilizing energy derived from oxidation to support microbial growth. Unsuccessful attempts have been made to isolate organisms capable of utilizing compounds like DDT and 2,4,5-T as sole sources of carbon and energy for growth. However, cometabolism of these materials has occurred in the laboratory. The process does not result in complete mineralization of the molecule, but it does eliminate the toxicity. By the action of several species, complete degradation can sometimes be accomplished. Field studies are needed in this area to establish

the susceptibility of these substances to degradation in soil and water. The degradation of the herbicide 2,3,6-TBA was accomplished by microbial populations present in lake water under laboratory conditions without a significant increase in microbial growth. Application of the term recalcitrant to pesticides such as DDT and 2,3,6-TBA may be the result of fallible procedures which do not consider the cometabolism phenomenon, rather than the inactivity of the microorganisms.

73-0880. Ptashne, K. A.; Neal, R. A.* (Div. of Toxicol., Vanderbilt Univ. School of Med., Nashville, TN 37232). **Reaction of parathion and malathion with peroxytrifluoroacetic acid, a model system for the mixed function oxidases.** *Biochemistry 11(17): 3224-3228; 1972.* (24 references)

The mechanism of the enzyme-catalyzed degradation of several phosphorothionates was studied using the nonenzymatic reaction with peroxytrifluoroacetic acid. The products of the second order reaction of this compound with parathion were diethylphosphoric acid, paraoxon, and tetraethylpyrophosphate. The energy of activation for the formation of paraoxon was about 6400 kcal/mole. Dimethylphosphorothioic acid was the major product of reaction of malathion. The complete model system (peroxytrifluoroacetic acid) was required for conversion since neither parathion, paraoxon, nor malathion reacted with trifluoroacetic acid anhydride or hydrogen peroxide alone. The reaction appears to be a valid model for the mixed function oxidase-catalyzed metabolism of these compounds.

73-0881. Rajamanickam, C.; Amrutavalli, J.; Rao, M. R. S.; Padmanaban, G. (Dept. of Biochem., Indian Inst. of Sci., Bangalore-12, India). **Effect of hexachlorobenzene on haem synthesis.** *Biochem. J. 129(2): 381-387; 1972.* (30 references)

Several drugs are known to induce the liver microsomal mixed-function oxidase system when administered in vivo or even in vitro in cell culture. A sequence of events has been suggested in which the drug is visualized to induce δ-aminolevulinate synthetase, the first and rate-limiting enzyme of the heme-biosynthetic pathway, which is followed by enhanced heme synthesis and cytochrome P-450 content, facilitating the increase in the drug metabolizing activity of the liver microsomal fraction. The present studies show that the fungicide hexachlorobenzene, when administered to female rats, can lead to enhanced amounts and rate of synthesis of cytochrome P-450 under conditions when the rate of total heme synthesis has not appreciably altered. The subsequent increase in the rate of total heme synthesis as well as the initial increase in amounts of cytochrome P-450 are brought about under conditions when δ-aminolevulinate synthetase activity remains constant. However, manifestation of porphyria due to prolonged drug administration is accompanied by a twofold increase in δ-aminolevulinate synthetase activity. The increase in enzyme activity appears to be due to a decreased degradation rate of the enzyme. (Author abstract by permission)

73-0882. Flockhart, I. R.; Casida, J. E.* (Div. of Entomol., Univ. of California, Berkeley, CA 94720). **Relationship of the acylation of membrane esterases and proteins to the teratogenic action of organophosphorus insecticides and eserine in developing hen eggs.** *Biochem. Pharmacol. 21(19): 2591-2603; 1972.* (31 references)

The yolk sac membrane from hen eggs contains esterases that hydrolyze phenyl phenylacetate (PPA) and are sensitive to inhibition, both in vitro and in vivo, by many organophosphorus compounds and by eserine. These esterases are the principal proteins in the membrane which are phosphorylated by ^{3}H-diisopropyl phosphorofluoridate. Inhibition of this mixture of PPA-hydrolyzing esterases in vivo does not correlate with the induction of teratogenesis because they react with both teratogenic and non-teratogenic acylating agents. However, electrophoresis studies indicate that inhibition in vivo of one or more separable components making up a very small proportion of the total membrane esterase mixture occurs with teratogenic but not with non-teratogenic treatment schedules. Thus, dialkylphosphorylation or methylcarbamoylation of this reactive membrane component(s) in vivo may initiate a sequence of events leading to embryonic abnormalities. This postulated mode of action is analogous to that proposed earlier by British workers in the production of delayed neurotoxicity by some organophosphorus compounds. (Author abstract by permission)

73-0883. Filbert, M. G.; Fleisher, J. H.; Lochner, M. A (Dept. of the Army, Edgewood Arsenal, Biomed. Lab., Edgewood Arsenal, MD 21010). **Failure of toxogonin to reactivate soman-inhibited brain acetylcholinesterase in monkeys and regeneration of the enzyme.** *Biochim. Biophys. Acta 284(1): 164-174; 1972.* (34 references)

Administration of toxogonin (obidoxime) to monkeys intoxicated with pinacolyl methylphosphonofluoridate (soman) did not result in significant reactivation ($P = 0.05$) of inhibited acetylcholinesterase (acetylcholine hydrolase, EC 3.1.1.7). "Aging," i.e. refractoriness of reactivation due to rapid dealkylation of the soman-inhibited enzyme, can be minimized if inhibition of acetylcholinesterase is carried out at pH 8.8 and 0 °C. Nevertheless, addition of $5 \times 10^{-5} M$ toxogonin, a concentration which could be expected from physiologically acceptable dosage in vivo, did not result in reactivation of the unaged, inhibited enzyme. Therefore, aging and inability of the oxime to cross the blood-brain barrier are of secondary importance in the failure of toxogonin

to reactivate brain acetylcholinesterase inhibited by soman. Another part of this study concerned the temporal relationship between the persistent central depression of respiration seen in monkeys after poisoning with soman and the degree of inhibition of brain acetylcholinesterase. The overall acetylcholinesterase activity of the pons and medulla showed significant regeneration within 72 hr although respiratory function did not return during this time. One explanation might be that much of the enzyme activity measured may represent cholinesterase molecules that have not yet arrived at vital sites. Consequently, the functionally active acetylcholinesterase may not have reached a level adequate to maintain respiratory function. (Author abstract by permission)

73-0884. Koudela, K.; Sova, Z.; Trefny, D.; Vrbenska, A.; Houska, J.; Hrdinova, A.; Nemec, Z.; Janda, J.; Pujman, V. (Dept. Domestic Animal Physiol., Agr. Inst., Prague, Czechoslovakia). **Vliv malych a vetsich davek endrinu na nektere biochemicke ukazatele u bazantu. [The influence of small and of larger doses of endrin on some biochemical parameters in pheasants *(Phasianus colchicus* L.).]** *Biol. Chem. Vyz. Zvirat 8(1): 47-57; 1972.* (8 references) (Czech)

Two groups of ranch-raised pheasants were given endrin in the feed at 0.8 mg and 2.55 mg/kg body weight respectively for 14 days. Slight changes in total serum protein occurred; in pheasants fed the higher endrin dose a significant drop in beta globulin was noted. Serum uric acid was unaffected but the level of uric acid in the liver decreased significantly. Although GOT activity in the liver and in the serum did not change markedly, GPT activity in the liver decreased. Alkaline phosphatase activity increased in the liver of birds fed the higher endrin dose. Changes in specific liver enzyme activity also occurred over the course of the experiment: GOT and GPT activities declined, alkaline phosphatase activity in the 2 groups dropped first and then increased to the limit of statistical significance. Changes in the fat metabolism of the kidneys were within limits of statistical significance.

73-0885. Buselmaier, W.; Roehrborn, G.; Propping, P. (Inst. fuer Anthropol. und Humangenetik der Universitaet Heidelberg, Heidelberg, Germany). **Mutagenitaets-Untersuchungen mit Pestiziden im Host-mediated assay und mit dem Dominanten Letaltest an der Maus. [Mutagenicity studies with pesticides in the host-mediated assay and with the dominant lethal test in the mouse.]** *Biol. Zentralbl. 91(3): 311-325; 1972.* (35 references) (German)

Sixteen pesticides and pesticide derivatives, including organochlorines, organophosphates, herbicides, and fungicides, were tested for mutagenicity by the host-mediated assay using *Salmonella typhimurium* and *Serratia marcescens*. Captan, ethylene dibromide, DDD (TDE), and possibly MCPB produced elevated mutation rates in one or both of the test bacterial strains. Of the four pesticides (DDT, DDA, 2,4,5-T, and MCPB) tested in the dominant lethal test, the first two were adjudged possibly mutagenic.

73-0886. Fletcher, K.; Wyatt, I. (Imperial Chem. Ind. Ltd., Ind. Hyg. Res. Lab., Alderley Park, Nr. Macclesfield, Cheshire SK10 4TJ, England). **The action of paraquat on the incorporation of palmitic acid into dipalmitoyl lecithin in mouse lungs.** *Brit. J. Exp. Pathol. 53(2): 225-230; 1972.* (24 references)

Incorporation of tritium labeled palmitic acid into dipalmitoyl lecithin in the lungs of mice occurred within 30 sec of injection. The mean half-life of the labeling was approximately 15 hr. Pre-treatment of mice for 6 days with 125 mg/kg paraquat dichloride did not alter the amount of dipalmitoyl lecithin present nor its rate of destruction. These and previously obtained results suggest that the biochemical action of paraquat is not connected with phospholipid metabolism in the lung.

73-0887. Jefferies, D. J.; French, M. C.; Osborne, B. E. (The Nature Conservancy, Monks Wood Experimental Station, Abbots Ripton, Huntington, England). **The effect of *p,p'*-DDT on the rate, amplitude and weight of the heart of the pigeon and Bengalese finch.** *Brit. Poult. Sci. 12(3): 387-399; 1971.* (30 references)

Pulse rates recorded at 3 and 6 wk in homing pigeons decreased during daily dosing with 3 mg DDT/kg. A significant decrease in S wave amplitude was observed at doses from 3 to 36 mg/kg. Heart weight increased with the 3 mg/kg dose after 8 wk, but decreased with doses from 6 to 54 mg/kg. Adrenal weights increased in birds dosed at 54 mg/kg. Bengalese finches had a slightly increased pulse rate and S wave amplitude at all doses. Pigeons treated with 3 and 36 mg/kg for 8 wk had liver levels of 10.4 and 58.3 ppm DDT, respectively, and 16.4 and 293.7 ppm DDE, respectively. The corresponding values for brain were 2.9 and 13.5 ppm, 4.1 and 94.5 ppm. Liver levels were also recorded for finches. DDT may cause hyperthyroidism at low doses and hypothyroidism at high doses in pigeons. Results with Bengalese finches suggest hyperthyroidism only.

73-0888. Bordeleau, L. M.; Bartha, R. (Station de Rech. Ste. Foy, Quebec 10, Canada). **Biochemical transformations of herbicide-derived anilines in culture medium and in soil.** *Can. J. Microbiol. 18(12): 1857-1864; 1972.* (25 references)

A correlation was established between peroxidase activity of soil and its capacity to transform 3,4-dichloroaniline, a breakdown product of several herbicides, to 3,3',4,4'-tetrachloroazobenzene. Supplementa-

tion of soil by carbon and nitrogen sources for microbial growth stimulated both activities and pointed to the microbial origin of soil peroxidases. Several peroxidase-producing bacteria, actinomycetes, and fungi were isolated from soil and were characterized. On the basis of its rapid growth and high peroxidase activity, a *Geotrichum candidum* strain was selected for further study. The culture filtrate of this organism exhibited both peroxidase and aniline oxidase activity. The highest per milligram dry weight activity of these enzymes was observed after cultivation on a mineral salts medium supplemented with soil extract and yeast extract. (Author abstract by permission)

73-0889. Bordeleau, L. M.; Bartha, R. (Station de Rech. Ste. Foy, Quebec 10, Canada). **Biochemical transformations of herbicide-derived anilines: purification and characterization of causative enzymes.** *Can. J. Microbiol. 18(12): 1865-1872; 1972.* (20 references)

From culture filtrate of the soil fungus *Geotrichum candidum* two extracellular enzymes were separated that were active in transformation of aniline. Using a concentration, salt precipitation dialysis, and gel filtration sequence, the two enzymes, a peroxidase and an aniline oxidase, were purified 54- and 68-fold, respectively. The characteristics of the partially purified enzymes were compared and were found to be for peroxidase and for aniline oxidase, respectively, as follows: optimal pH = 4.4-5.0 and 4.8-5.4, energy of activation (Q_{10}) = 3.0 and 1.6, apparent *Km* (aniline) 3.1×10^{-4} and 4.4×10^{-4} *M*. *Km* (H_2O_2) for peroxidase was 2.4×10^{-6}, (O_2) for aniline oxidase was 9.1×10^{-4} *M*. In the natural soil environment, peroxidase seems to have a greater role in pesticide residue transformation than aniline oxidase. (Author abstract by permission)

73-0890. Bordeleau, L. M.; Bartha, R. (Station de Rech. Ste. Foy, Quebec 10, Canada). **Biochemical transformations of herbicide-derived anilines: requirements of molecular configuration.** *Can. J. Microbiol. 18(12): 1873-1882; 1972.* (22 references)

4-Chloroaniline transformation products, generated in soil and by partially purified enzymes of the soil fungus *Geotrichum candidum* were compared using autoradiochromatography. The results of this comparison indicated that these enzymes constitute a useful model system for investigation of aniline susceptibility to polymerizing transformations. Forty-three variously substituted anilines were exposed to the fungal enzymes and the reaction products were analyzed by spectrometric and gas chromatographic methods. Susceptibility to enzymic transformation increased with increasing electron density at the amino group. Electron-releasing substituents increased yields of higher polymers, but decreased the yields of azobenzenes. Anilines substituted by electron-attraction groups in both *ortho* positions resisted enzymic transformations. The results allow predictions about the environmental fate of pesticide-derived aniline residues. (Author abstract by permission)

73-0891. Shah, A. H.; Guthrie, F. E. (Dept. of Entomol., North Carolina State Univ., Raleigh, NC 27607). **Penetration of insecticides through the isolated midgut of insects and mammals.** *Comp. Gen. Pharmacol. 1(4): 391-399; 1970.* (27 references)

In experiments using isolated midgut of two insect species and mouse small intestine, the penetration of ^{14}C-labeled carbaryl, malathion, nicotine, DDT, and dieldrin was similar with respect to pattern of penetration although total penetration of each insecticide varied considerably. DDT and dieldrin penetrated relatively poorly. In mouse 2 to 6% of either insecticide penetrated the "sac" in 80 min and 24% was bound to it. From 20 to 63% of the other compounds was recovered outside the "sac" after 80 min. Penetration correlated with lipid solubility; i.e., the lower the partition coefficient, the more rapid the rate of penetration. The correlation was not evident in mouse with the organochlorines and nicotine. Results of experiments with carbaryl, in which DNP or iodoacetic acid were added to either the internal or external solution to study energy dependence, indicated a passive penetration. Perfusion experiments gave penetration results similar to those obtained by the "sac" method.

73-0892. David, D.; Lutz-Ostertag, Y. (Lab. de Biologie Animale, Univ. de Clermont, Aubiere, France). **Etude comparative de l'action du DDT sur la mortalite, la morphologie externe et interne chez l'embryon de poulet et de caille. [A comparative study of the action of DDT on the mortality and the external and inner morphology of chicken and quail embryo.]** *C. R. Acad. Sci. Paris Ser. D 275(19): 2171-2173; 1972.* (French)

The action of DDT on the mortality and the external and inner morphology of chicken and quail embryo was studied. Non-incubated eggs were immersed in water containing 2, 3, 5, or 10 g of DDT per liter for 30 sec. The embryonal mortality in chicken was a function of the actual dose, ranging from 9 to 27.5% while all DDT concentrations caused a mortality of 35% in quail embryo. Reduced size and vitality, abnormal and paralyzed feet, and some cases of lordosis were observed. The percentage of hatched chickens affected by such morphological alterations ranged from 22 to 46;, a DDT concentration of 2 g/l. accounted for 44% in quail. Dark green color of the liver with reduced glycogen level and fatty degeneration and edematous mesonephros with hypertrophic and degenerated cells were observed due to a DDT concentration of 3 g/l. and up. The respective frequencies of such mesonephric alterations in chickens and quails were 18-41% and 2-9%.

73-0893. Rueckert, I.; Ghelberg, N. (Oeffentl. Sanit. Med. Forschungsinst., Cluj, Rumania). **Experimentelle Untersuchungen ueber den Einfluss einiger organisch-phosphorhaltiger Insektizide auf den Sauerstoffgehalt des Wassers. [Experimental investigations into the influence of some organic-phosphorus insecticides on the oxygen content of water.]** *Deut. Gewaesserk. Mitt. 15(1): 16-23; 1971.* (7 references) (German)

Pesticides primarily affect the oxygen content of water via stimulation or inhibition of microbial growth while effects vary depending on the concentration and formulation of pesticide used, the number and types of microbes in the water, and the contact time under consideration. Malathion and dimethoate emulsions stimulated oxygen consumption 50-60% when added to slightly polluted river water at 3-4 mg/l. and scarcely affected oxygen production. Malathion and dimethoate inhibited oxygen production completely at high concentrations. Ethion began to inhibit oxygen consumption at a concentration of 40 mg/l. and oxygen production at 9 mg/l.; at lower concentrations some stimulation was apparent. Bromophos and ronnel are inhibitory to both processes at 2-200 mg/l. The emulsifiers used in the formulations of these pesticides also inhibited oxygen consumption and production. Following storage of the water samples contaminated with the insecticides, the inhibitory effects generally decreased, and in some cases stimulation was noted, especially in samples stored for 45 days. The stability of the aqueous insecticide solutions decreased in the order malathion < dimethoate < ethion < bromophos < ronnel, in the reverse order of the toxicity.

73-0894. Simpson, Jr., R. L. (Cornell Univ., Ithaca, NY). **The ecological effects of the aquatic herbicide Fenac on small ponds.** *Diss. Abstr. Int. 32(10): 5748-B; 1972.*

Fenac was applied at 2 ppm twice in twelve 0.1 ha experimental ponds near Ithaca, New York between June 1968 and October 1969. Fenac eliminated rooted aquatic vegetation; however, it only slightly affected several benthic algae. The most noticeable short-term effects were the depression of dissolved oxygen levels, an increase in community respiration, and the reduction of carbonate ion in the first month after treatment. The first two resulted from bacterial decomposition of dead plant material, and the third probably resulted from a lowered demand for carbon by benthic plants. These changes were short lived and did not appear to affect phytoplankton productivity or zooplankton. Where large masses of vegetation are to be controlled, Fenac should be applied shortly after plant growth has begun to circumvent oxygen depletion. Fenac should be used with caution because it may persist for several months and the degree to which it is biologically magnified has not been determined. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 72-9938)

73-0895. Spasovski, M. C.; Markov, D. V. (Res. Inst. of Ind. Hyg. and Occup. Dis., Min. of Pub. Health, Bulgaria). **[Effects of] Cuprozin administration on the fine structure of rat liver parenchymal cells.** *Dokl. Bolg. Akad. Nauk 23(11): 1453-1456; 1970.* (12 references)

Cuprozin (copper ethylenebis(dithiocarbamate)) was orally administered to rats for 10 months at 120 mg/kg daily to determine its effects on the fine structure of liver parenchymal cells. Two months of administration greatly reduced the rough endoplasmic reticulum (RER). Other changes included partial or complete destruction of the mitochondrial envelope; presence of golgi dictyosomes with strongly dilated cisternae containing an electron-dense substance which gave them a honeycomb appearance; and even distribution of immense masses of glycogen granules. No proliferation of smooth endoplasmic reticulum was observed. After continuous administration of the pesticide for four months, the RER was fully restored quantitatively but lacked parallel array of the cisternae; mitochondrial injury has almost disappeared. After the seventh month the fine structure of the hepatic parenchymal cells appeared to be normal.

73-0896. Santolucito, J. A.; Whitcomb, E.; Hassan, A. (Environ. Protect. Agency, Perrine Primate Lab., P.O. Box 490, Perrine, FL 33157). **Pharmacological effects of carbaryl. III. Observations on alteration of smooth muscle-preparation responses to norepinephrine.** *Environ. Physiol. Biochem. 2(3): 142-146; 1972.* (6 references)

The effect of carbaryl on smooth muscle motility was investigated in vitro in the presence of sympathetic blocking agents and norepinephrine. Amplitude and rhythm of contractions increased upon addition of carbaryl alone to a duodenal segment. Previously added carbaryl antagonized the rapid and complete inhibition of motility by norepinephine. When the cholinergic response to carbaryl in segments of ileum was prevented with atropine, inhibition developed slowly. Carbaryl produced progressive inhibition when added to a non-estrogenized uterine segment, but it did not change the pattern of motility in estrogenized uterus. Carbaryl may, in addition to inhibiting cholinesterase, exert a sympathomimetic effect peripherally.

73-0897. Baker, R. C.; Coons, L. B.; Mailman, R. B.; Hodgson, E. (Dept. of Entomol., N. Carolina State Univ., Raleigh, NC 27607). **Induction of hepatic mixed function oxidases by the insecticide, mirex.** *Environ. Res. 5(4): 418-424; 1972.* (20 references)

The effect of mirex (dodecachlorooctahydro-1,3,-4-methano-2*H*-cyclobuta-[c,d]pentalene) on hepatic cytochrome P-450 and *O*-demethylase activity has been tested in rats and mice by both injection and feeding studies. Intraperitoneal injection of mirex at a dose rate

of 10 mg/kg or higher increased the hepatic microsomal cytochrome P-450 level in mice. Under the same conditions 25 mg/kg was necessary to elicit the same response in the rat. The *O*-demethylase activity was also increased. Dietary mirex caused induction of cytochrome P-450 in the rat at all levels tested (1-250 ppm for 14 days). Examination of type I and type II substrate difference spectra indicates that not only was induction at higher levels (100-250 ppm for 14 days) greater, but also the cytochrome induced was qualitatively different from that induced at lower levels. Ultrastructural examination of the liver tissue after mirex feeding revealed a proliferation of the smooth endoplasmic reticulum. (Author abstract by permission of Academic Press)

73-0898. Bercken, J. van den, (Inst. of Vet. Pharmacol. and Toxicol., Univ. of Utrecht, Biltstraat 172, Utrecht, The Netherlands). **The effect of DDT and dieldrin on myelinated nerve fibres.** *Eur. J. Pharmacol. 20(2): 205-214; 1972.* (33 references)

The effects of DDT and dieldrin on myelinated nerve fibers of the clawed toad were investigated using compound action potentials, action potentials of single nerve fibers, and membrane potentials of single nodes of Ranvier. DDT ($5X10^{-4}M$) affected only the falling phase of the action potential, either slowing it down or inducing a large negative afterpotential. At 25 mg/kg DDT was toxic and induced repetitive activity in sensory fibers but not motor nerves. The number of repetitive action potentials increased gradually with increasing amplitude of the negative afterpotential while the interval between the action potentials decreased, suggesting that the negative afterpotential produced by DDT is probably responsible for the repetitive activity. Sodium inactivation was considered as a mechanism by which the repetitive activity could be induced by the negative afterpotential. Although symptoms of poisoning were seen in dieldrin-treated animals, no repetitive activity was observed in their sciatic nerves. Nerves bathed in Ringer solution containing dieldrin (up to $10^{-3}M$ for 24 hr) did not show any sign of repetitive activity. It is evident that with vertebrates as with insects, the peripheral nervous system is closely involved in DDT intoxication. Dieldrin may be converted to aldrin-*trans*diol in the cockroach before exerting neurotoxic action, but it is not known if this conversion takes place in toads and other vertebrates.

73-0899. Fournier, E. (Author address not given). **Classification chimique de certains pesticides organophosphates chez l'homme et discussion de leur toxicite retardee. [Chemical classification of certain organophosphorus pesticides and their chronic toxicity in man.]** *Eur. J. Toxicol 4(5): 416-421; 1971.* (12 references) (French)

Nomenclatural and general human toxicological problems of organophosphorus pesticides are reviewed. The intoxication hazards are dependent on factors such as the absorption and penetration through the membranes, the distribution between water and lipids, hepatic metabolism, the affinity to esterases and to cholinesterases, the reactivity with acetylcholinesterases and on the presence of nucleophilic groups. The acute neurotoxicity of organophosphorus pesticides is due to the lesion of the nervous cytoplasm. Various hypotheses on the neurotoxic action (esterase inhibition, enzymatic phosphorylation) are reviewed. The chronic toxicity manifests itself in cholinesterase inhibition due to esterification. Oximes such as contrathion, which release the phosphate radical from the enzyme, are antidotes of organophosphorus pesticides.

73-0900. Chkanikov, D. I.; Makeyev, A. M.; Pavlova, N. N.; Dugovoy, V. P. (All-Union Res. Inst. of Phytopathology, Bol'shiye Vyazemy, USSR). ***N*-(2,4-dikhlorfenoksiatsetil)-L-glutaminovaya kislota-novyy metabolit 2,4-D. [*N*-(2,4-dichlorophenoxyacetyl)-L-glutamic acid-a new metabolite of 2,4-D.]** *Fiziol. Rast. 19(2): 436-442; 1972.* (9 references) (Russian)

A new metabolite of 2,4-D, *N*-(2,4-dichlorophenoxyacetyl)-L-glutamic acid, was isolated along with *N*-(2,4-dichlorophenoxyacetyl)-L-aspartic acid from young soybean plants treated previously with ^{14}C labeled 2,4-D. These two conjugates had the same mobility during paper-chromatographic investigation in different solvents but could be separated by gas-liquid chromatography. They underwent quantitative hydrolysis in 6 *N* hydrochloric acid at 100°C for two hours and yielded 2,4-D and equimolar amounts of aspartic and glutamic acids. Amino acid derivatives of 2,4-D accumulated mainly in the treated leaves of soya and presumably were not transferred into other organs. Such derivatives were absent in the phloem sieve tubes as confirmed by experiments employing aphids feeding on 2,4-D-treated plants. The production of amino acid derivatives is supposed to be one of the ways of 2,4-D immobilization by the leaf tissues.

73-0901. Kovtun, S. D. (All-Union Inst. Hyg. and Toxicol. of Pesticides, Polymers and Plastics, Lab. Exp. Toxicol., Kiev, USSR). **Zminy miniatyurnykh potentsialiv kintsevoyi plastynky ta potentsialiv spokoyu m'yazovykh volokon pid vplyvom khlorofosu. [Chlorophos-induced changes in end-plate micropotentials and muscular fiber resting potentials.]** *Fiziol. Zh. (Kiev) 18(1): 23-28; 1972.* (27 references) (Ukrainian)

Intracellular electric potential recordings were taken in white rats treated intragastrically with chlorophos (trichlorfon) to study the physiological processes occurring at synaptic levels. A microelectrode penetrating the cell membrane (tail muscle) provided mus-

cular fiber resting potential (RP) recordings which averaged 70 ± 4.7 mV in controls, 77 ± 7.4 mV in rats receiving a single dose of 425 mg/kg, and 73 ± 4.3 mV in rats treated daily with 42.5 mg/kg chlorophos for two months. Negative electricity was located in the central portion of the cell. End-plate micropotentials (EPMP) were produced when the edge of the microelectrode cut through a cell membrane located close to a myoneural termination and consisted of short-lasting resting potential drops with an average amplitude of 0.4 ± 0.06 mV in control rats. Rats receiving a single dose of 425 mg/kg chlorophos had a 62% increase in the EPMP amplitude and a 36% decrease in frequency with respect to the controls. Similar EPMP amplitude changes with a 53% frequency decrease were seen in rats treated with the 42.5 mg/kg dose for two months. Rats receiving a daily dose of 8.5 mg/kg chlorophos for 6 months had EPMP amplitudes reaching 122% and no alterations in their frequency with respect to controls. The increased EPMP amplitudes caused by chlorophos were attributed to its acetylcholinesterase inhibitory effects and to alterations caused in the spontaneous release of acetylcholine by the nerve terminations. The latter were responsible for functional alterations of the myoneural synapse and indicated a direct effect of chlorophos on the acetylcholine receptor. No dose-effect relationships in terms of EPMP amplitudes could be established.

73-0902. Ivanova, S. I. (All-Union Inst. Hyg. and Toxicol. of Pesticides, Polymers, and Plastics, Kiev, USSR). **Deyaki histomorfolohichni ta histokhimichni zminy v miokardi prv khimichnomu otruyenni DDT i polikhloropinenom. [Histomorphological and histochemical alterations of the myocardium caused by poisoning with DDT and polychloropinene.]** *Fiziol. Zh. (Kiev) 18(3): 391-396; 1972.* (19 references) (Ukrainian)

The cardiotoxicity of DDT and polychloropinene to rats was studied during peroral administration of equitoxic daily amounts (0.01 LD50, 4.25 and 3.5 mg/kg respectively). The morphological and histochemical changes occurring in the myocardium after one, three, and four months of treatment were observed. Both compounds induced circulatory damage during the first stage of the experiment. Blood stasis from polychloropinene, however, was observed only at the capillary level while DDT produced severe local hemorrhage after three months of treatment. Structural alterations were first observed in isolated fibers exhibiting granular changes and pyknotic nuclei; some of the fibers underwent myolysis and karyolysis during the later stages of the experiment. The decreased formasan staining properties of the preparations, observed soon after the beginning of the experiment, were indicative of decreased succinyl dehydrogenase activity and of mitochondrial damage. The decreasing amounts of total glycogen on account of the bound glycogen indicated an impairment in carbohydrate metabolism with respect to free glycogen consumption. The progressive degeneration of the fuchsinophilic properties of the myocardial fibers was accompanied by an overall protein dystrophy condition. The glycogen and succinyl dehydrogenase alterations were concluded to be the most sensitive tests during the early stages of organochlorine poisoning.

73-0903. Vashkulat, N. P. (A. N. Marzeyev Sci. Res. Inst. of Gen. and Communal Hyg., Kiev, USSR). **Mysh'yakosoderzhashchiye soyedineniya i ikh toksikologicheskaya kharakteristika. [Arsenic compounds and their toxicological investigation.]** *Gig. Sanit. 37(6): 99; 1972.* (Russian)

Chronic effects of daily oral 0.05, 0.5, and 5 mg/kg doses of arsenic on white rats were studied over six months. While no alterations in the group fed 0.05 mg/kg doses were detected, animals fed 0.5 mg/kg doses became listless and developed diarrhea by the fourth month of the experiment. Three animals in the group treated with 5 mg/kg doses died in the third month. Loss of weight started in the third month in the third, and in the fourth month in the second group. Reduced cholinesterase activity and SH-group level were observed due to 0.5 and 5 mg/kg doses from the first and fifth months, respectively. Statistically significant changes in the serum pyruvic acid contents, present from the beginning in the third group, appeared in the second group at the end of the third month. Investigations of internal organs such as brain, heart, lung, liver, kidney, spleen, adrenal glands, and intestines revealed gradual accumulation of arsenic, hemodynamic alterations, and inflammatory and dystrophic processes due to arsenic doses of 0.5 and 5 mg/kg.

73-0904. Antonovich, Ye. A.; Chernov, O. V.; Samosh, L. V.; Martson', L. V.; Pilinskaya, M. A.; Kurinnyy, L. I.; Vekshteyn, M. Sh.; Martson', V. S.; Balin, P. N.; Khitsenko, I. I. (All-Union Sci. Res. Inst. Pesticide, Polymer and Plastics Hyg. and Toxicol., Kiev, USSR). **Sravnitel'naya toksikologicheskaya otsenka ditiokarbamatov. [A comparative toxicologic assessment of dithiocarbamates.]** *Gig. Sanit. 37(9): 25-30; 1972.* (4 references) (Russian)

The oral toxicity of thiram, ziram, zineb, maneb, and polycarbazine was studied in albino rats and in mice in comparative toxicological experiments. Thiram and maneb proved to be most toxic of all pesticides investigated. Ziram had more pronounced cumulative, teratogenic, gonadotoxic, tumorigenic and especially cytogenic effects than maneb or zineb. Maneb had the greatest embryotoxic and tumorigenic activity. The mutagenic effect and chronic toxicity of thiram exceed those of ziram, zineb, and maneb. The pathologic effects of zineb and polycarbazine were least pronounced.

73-0905. Krasil'shchikov, D. G. (Sci. Res. Inst. Epidemiol., Microbiol. Hyg., Min. of Pub. Health of the Lithuanian SSR, Vilnyus, USSR). **Vliyaniye prisutstviya v vode detergentov na postupleniye geksakhlorana v pechen' i zhirovuyu tkan' belykh krys. [The penetration of hexachlorane into white rat liver and adipose tissue as affected by the presence of detergents in water.]** *Gig. Sanit. 37(9): 96-97; 1972.* (2 references) (Russian)

The uptake and accumulation of hexachlorane (BHC) in the liver and abdominal adipose tissues of white rats from aqueous solution with or without alkylbenzenesulfonate (Sulfonol NP-1) were studied. Single 114 mg/kg doses of hexachlorane or 450 mg/kg doses of alkylbenzenesulfonate or a mixture of both were administered to three different groups through gastric tube; other groups were given 57 mg/kg doses of hexachlorane or 230 mg/kg doses of alkylbenzenesulfonate or mixtures in another 20 day experiment. The hexachlorane levels in the liver and especially in the adipose tissue were much higher when hexachlorane was combined with alkylbenzenesulfonate; the increase was more pronounced for single than for chronic administration of the two compounds. The increased resorption and accumulation of hexachlorane in hepatic and adipose tissues in the presence of alkylbenzenesulfonate is apparently due to the ability of the latter to emulsify the pesticide.

73-0906. Arsen'yeva, M. V. (Moscow I. M. Sechenov First Med. Inst., Moscow, USSR). **Sravnitel'naya otsenka toksichnosti DDT i urana na intaktnykh zhivotnykh i zhivotnykh s eksperimental'nym gepatitom i nefritom. [A comparative assessment of the toxicity of DDT and uranium to intact animals and those with experimental hepatitis and nephritis.]** *Gig. Sanit. 37(10): 27-30; 1972.* (9 references) (Russian)

Acute, subacute, and chronic toxicity of DDT were studied in healthy albino rats and in those with carbon tetrachloride-induced hepatitis; uranium and chromium toxicity in healthy rats and in those with mercuric chloride induced nephritis were also studied. The LD50 values of DDT, uranium, and chromium in normal and in induced animals were 300, 750, and 27.5 mg/kg and 225, 800, and 25 mg/kg, respectively. A three month subacute test showed 2 mg/kg doses of DDT ineffective while 10 and 50 mg/kg doses significantly increased alkaline phosphatase and alanine transaminase activities with negligible difference between normal and hepatitic animals. Subacute 0.6 mg/kg doses of uranium were ineffective, but 6 and 60 mg/kg doses significantly increased the alkaline phosphatase activity, serum urea level, and the urine GOT level. The results indicate no significant difference in the reaction of normal and induced animals due to considerable functional reserves present in the damaged organs even under poisoning conditions.

73-0907. Linyuchev, N. M.; Mima, Yu. P.; Sergeyev, V. V. (S. M. Kirov Military Med. Inst., Leningrad, USSR). **Vliyaniye fenobarbitala na toksichnost'i antikholinesteraznuyu aktivnost khlorofosa. [The action of phenobarbital on the toxicity and anticholinesterase activity of trichlorfon.]** *Gig. Sanit. 37(10): 106-107; 1972.* (3 references) (Russian)

The action of phenobarbital on the toxicity and anticholinesterase activity of trichlorfon administered to mice intra-abdominally or orally was studied. Phenobarbital doses of 14 mg/kg administered intraperitoneally over three days previously increased the intraperitoneal and oral LD50 values of trichlorfon from 394 to 477 mg/kg and from 514 to 701 mg/kg, respectively. Phenobarbital reduced the rate of inhibition of the cholinesterase activity in the brain. The residual cholinesterase activity following the intraperitoneal administration of trichlorfon to mice pretreated with phenobarbital was 42% against 24.5% in the control.

78-0908. Tomatis, L.; Turusov, V.; Day, N.; Charles, R. T. (International Agency for Res. on Cancer, 69 Lyon, France). **The effect of long-term exposure to DDT on CF-1 mice.** *Int. J. Cancer 10(3): 489-506; 1972.* (32 references)

Technical DDT, with an LD50 of 237 and 251 mg/kg in the male and female animals used, was administered in the diet to CF-1 minimal inbred mice for the life span of two generations at levels of 2, 10, 50 and 250 ppm. These concentrations did not seem to impair fertility or fecundity, and pre-weaning mortality was only noticeably higher with 250 ppm. Mortality was definitely higher in the 250 ppm group than in the other groups beginning at the 60th wk. The percentage of tumor-bearing animals was slightly higher in DDT-treated mice, particularly at the highest level. Incidence of liver tumors, but not lymphomas, osteomas, or lung tumors, was increased by DDT at all levels; liver tumors were observed at an earlier age in DDT-treated animals. A markedly high incidence of tumors was observed in females exposed to 250 ppm DDT compared to the 4 to 5% incidence in untreated females. A direct relationship was observed between the dose of DDT and the age of death from liver tumors as well as the incidence of liver tumors. Only four liver tumors, all occurring in DDT-treated mice, metastasized. Tumors were either well-differentiated nodular growths, compressing but not infiltrating the surrounding parenchyma, or nodular growths in which the architecture of the liver was obliterated, often showing trabecular or glandular patterns.

73-0909. Schuette, H. R.; Siegel, G.; Held, P.; Jumar, A. (Inst. Biochem. Pflanz., Deut. Akad. Wiss. zu Berlin, Berlin, DDR). **Ueber Metabolismus und Rueckstandsverhalten von Propham in Zuckerrueben. [Propham metabolism and residue contents in sugar beet.]** *Isotopen-*

praxis 7(8): 339-343; 1971. (39 references) (German)

The metabolism and fate of ^{14}C-labeled propham was studied in sugar beet. Propham is taken up by the root and translocated to the leaves, where a large portion is eliminated by transpiration through the stomata. Glycosides, especially conjugated *O*- and *N*-glycosides, aglycones of *O*-glycosides, and *N*-hydroxypropham were detected as metabolites during an incubation period of up to 7 days. In vitro tests with microsomal preparations from beet leaves and rat liver revealed five different, unidentifiable hydroxylated metabolites. A large part of the propham formed complexes with lignin. Complete oxidation of propham to carbon dioxide occurred to a negligible extent. The residue content found at harvest was mostly in a non-metabolized, non-extractable form, and it accounted for about 10% of the total quantity initially taken up by the plant.

73-0910. Cecil, H. C.; Bitman, J.; Harris, S. J. (Animal Physiol. and Genetics Inst., Agr. Res. Cent., U.S. Dept. of Agr., Beltsville, MD 20705). **Effects of different classes of pesticides on pentobarbital anesthesia and toxicity in Japanese quail.** *J. Agr. Food Chem. 21(1): 114-117; 1973.* (12 references)

Two hours after a single oral dose of DDT, methoxychlor, or malathion, Japanese quail responded with prolonged pentobarbital sleeping times. Prolonged sleeping times occurred 48 hr after DDT treatment. In contrast to DDT, sleeping times returned to control levels 24 hr after methoxychlor or malathion treatment. Abate reduced sleeping times, while Sevin (carbaryl) had no effect. Ad libitum feeding of DDT or methoxychlor prolonged pentobarbital sleeping times, but malathion, Abate, or Sevin had little effect. Although very few birds died from the toxicity of the pesticide alone, birds died in many pesticide groups when pentobarbital was administered. Mortality was greatest during anesthesia when pentobarbital had been administered 2 hr after a single oral dose of the pesticide. Ad libitum feeding of pesticides did not increase mortality during pentobarbital anesthesia. (Author abstract reprinted by permission of the American Chemical Society)

73-0911. Janes, N. F.; Machin, A. F.*; Quick, M. P.; Rogers, H.; Mundy, D. E.; Cross, A. J. (Min. of Agr., Fisheries, and Food, Central Vet. Lab., Biochem. Dept., New Haw, Weybridge, Surrey, England). **Toxic metabolites of diazinon in sheep.** *J. Agr. Food Chem. 21(1): 121-124; 1973.* (19 references)

Diazinon is oxidized in sheep to several cholinesterase-inhibiting metabolites. The structures of three of them were determined by direct spectroscopic measurement. Two are monohydroxy diazinons, and the third is a dehydration product of one of these. The three structures had already been proposed for diazinon metabolites produced by mice when the establishment of structure was based on cochromatography with synthetic samples. Some quantitative aspects of the distribution of the compounds in sheep are reported. (Author abstract reprinted by permission of the American Chemical Society)

73-0912. Kaufman, D. D.; Plimmer, J. R.; Klingebiel, U. I. (Agr. Environ. Qual. Inst., Agr. Res. Cent., U.S. Dept. of Agr., Beltsville, MD 20795). **Microbial oxidation of 4-chloroaniline.** *J. Agr. Food Chem. 21(1): 127-132; 1973.* (30 references)

4-Chloroaniline was degraded through at least two metabolic pathways by the soil fungus *Fusarium oxysporum* Schlecht. Oxidation of the aromatic amine group was the major mechanism of 4-chloroaniline metabolism, but acylation of the aromatic amine group also occurred. 4-Chlorophenylhydroxylamine, 4-chloronitrosobenzene, 4-chloronitrobenzene, 4,4′-dichloroazobenzene, 4,4′-dichloroazoxybenzene, and 4′-chloroacetanilide were isolated as metabolites of 4-chloroaniline. The identity of several of these metabolites was established by comparison of their chemical and physical properties with synthetic samples. It is probable that 4,4′-dichloroazoxybenzene was formed by oxidative condensation of two molecules of 4-chlorophenylhydroxylamine or by the condensation of 4-chloronitrosobenzene. 4,4′-Dichloroazobenzene could be formed by either the condensation of 4-chloroaniline with 4-chloro nitrosobenzene or by reduction of 4,4′-dichloroazoxybenzene. Further oxidation of 4-chloroaniline and its products to phenolic metabolites and the liberation of Cl^- were also observed. (Author abstract reprinted by permission of the American Chemical Society)

73-0913. Sacher, R. M.; Alt, G. H.; Darlington, W. S. (Agr. Div., Monsanto Commercial Products Co., St. Louis, MO 63166). **Insecticidal and anticholinesterase activity of benzotriazolyl methyl and dimethylcarbamates.** *J. Agr. Food Chem. 21(1): 132-135; 1973.* (14 references)

A new series of heterocyclic carbamates based on 1*H*-1-benzotriazol have been synthesized and evaluated as insecticides and as inhibitors of fly and bovine cholinesterases. Only in the dimethylcarbamates do regression analyses show high correlation between cholinesterase inhibition and chemical reactivity of the inhibitors as expressed by Hammett's σ constant. Anticholinesterase activity of the monomethylcarbamates increases and that of the dimethylcarbamates decreases with an increase in the σ value of the substituents. (Author abstract reprinted by permission of the American Chemical Society)

73-0914. Cohen, S. D.; Murphy, S. D.* (Dept. of Physiol., Kresge Cent. for Environ. Health, Harvard

Univ. Sch. of Pub. Health, Boston, MA 02115). **Dyrene toxicity and lack of carboxylesterase inhibition in mice and rats.** *J. Agr. Food Chem. 21(1): 140-141; 1973.* (7 references)

The intraperitoneal LD50 for Dyrene [2,4-dichloro-6-(*o*- chloroanilino)-*s*-triazine] in both rats and mice was <100 mg/kg. Neither single nor repeated injections of Dyrene caused a dose-dependent inhibition of liver carboxylesterase activity. Feeding rats 1000 and 5000 ppm of Dyrene in the diet for 3 weeks resulted in approximately a 20% decrease in liver carboxylesterase activity. This decrease did not seem to be toxicologically important because it did not affect the susceptibility of rats to malathion poisoning. Doses of 25 mg/kg or greater of Dyrene caused a rapid hypothermia in mice but not in rats. Dimethoxydyrene was much less toxic to mice than Dyrene and did not inhibit liver carboxylesterase activity in vivo or in vitro. (Author abstract reprinted by permission of the American Chemical Society)

73-0915. Soifer, F. K.; and Garlick, N. L.; Christy, K. (Huston, TX 77036 and Charleston, SC 29401). **Fenthion–and heartworm disease.** *J. Amer. Vet. Med. Ass. 161(8): 870, 872; 1972.* (3 references)

A Letter-to-the-Editor questions several features of a news article dealing with topical application of fenthion for control of canine heartworms. Fenthion has been shown to destroy all circulating microfilaria after 1 or 2 injections 2 wk apart, but has little effect on adult worms or infective larvae. Undesirable side effects can result; if these can be eliminated by topical application, it would be advantageous. In the reply the original use of the term microfilariae is defended and several references are included which deal with the efficacy of fenthion against the infective larvae of *Dirofilaria immitis*. Most of the toxicity and shock previously noted with fenthion are eliminated by topical application.

73-0916. Sumitomo Chem. Co., Ltd. (New Sumitomo Bldg., Kitahama, Higashi, Osaka, Japan). **Frenock.** *Jap. Pestic. Inform. 13: 10; 1972.*

Frenock (tetrapion), a selective and translocating herbicide especially effective against annual and perennial grasses of *Cyperaceae* and *Gramineae*, has acute oral LD50s of 9,200 mg/kg in male mice and 10,000 mg/kg in male rats. Acute dermal toxicity is 2,600 mg/kg in rats and the no-effect level in rats is >2,000 mg/kg. In carp the 48-hr TLM is 100 ppm. Frenock has a long residual and cumulative effectiveness and sometimes exhibits synergistic action in combination with other fast acting herbicides.

73-0917. Hokko Chemical Company (Chiyoda, Tokyo, Japan). **Ortran.** *Jap. Pestic. Inform. 13: 36-38; 1972.*

The new organophosphate insecticide Ortran (acephate) does not accumulate in the food chain, has a minimum impact on non-target species, and degrades into non-toxic products. Acute oral LD50s were 945 mg/kg in male rats, 866 mg/kg in female rats, and 361 mg/kg in mice. In beagles the minimum emetic dose was 215 mg/kg and the minimum lethal dose was 681 mg/kg. Acute dermal LD50 in rabbits was >2000 mg/kg. Only slight transient conjunctival irritation was observed in the rabbit eye irritation test. Guinea pigs exhibited no sensitivity or sensitization. Four hours of exposure to vapor produced no morbidity or mortality or change in ChE in rats. Oral administration of 400 mg/kg in rats produced less severe ChE inhibition than that produced by 15 mg/kg parathion. Atropine was an effective antidote. No abnormalities in food consumption, weight gain, survival, blood and urine, gross and microscopic pathology, or organ weights and ratios were observed after 90 days of exposure to 300 ppm in the diet in rats. Dietary levels of up to 100 ppm for one yr caused no significant effects other than ChE inhibition in dogs. No effects on fetal weight, teratogenic effects, or mutagenic effects were noted. The 96 hr TL50 for bluegill was 2050 ppm in contrast to 0.263 ppm for parathion. Ortran had a half-life of three days in soil.

73-0918. Jackson, W. T. (Dept. of Biological Sciences, Dartmouth College, Hanover, NH 03755). **Regulation of mitosis. III. Cytological effects of 2,4,5-trichlorophenoxyacetic acid and of dioxin contaminants in 2,4,5-T formulations.** *J. Cell Sci. 10(1): 15-25; 1972.* (22 references)

Inhibition of mitosis and the development of cytological abnormalities in the dividing endosperm cells of the African blood lily *(Hemanthus kathurinee* Baker) were caused by the dioxin contaminant of 2,4,5-T rather than the herbicide itself. Mitosis was not significantly different from that of controls in cells subjected to a 10^{-4} *M* solution of highly purified 2,4,5-T. Significant inhibition was observed in some phases of mitosis in cells subjected to 0.2 to 1.0μg/l. dioxin, 0.2μg/l. dioxin plus 10^{-4} *M* 2,4,5-T, or 10^{-4} *M* 2,4,5-T containing dioxin as a contaminant. Cells exposed to any of the dioxin preparations also formed dicentric bridges and multinuclei or a single large nucleus. Dioxin contaminants are therefore probably responsible for mutagenic effects of 2,4,5-T formulations.

73-0919. DeMiranda, P.; Feitknecht, U. F.; Gibbon, S. L.; Burrows, G. E.; Way, J. L.* (College Hall, Washington State Univ., Pullman, WA 99163). **Urinary metabolite of 1,1-trimethylene-1-(4-aldoximinopyridinium) dibromide (TMB-4) in the rat. I. Trimethylene-1-(4-aldoximinopyridinium)-1′-(4-cyanopyridinium) bromide.** *J. Pharmacol. Exp. Ther. 180(2): 435-445; 1972.* (34 references)

The metabolic fate of 1,1′-trimethylene-bis(4-aldoximinopyridinium) dibromide-1,1′-^{14}C (TMB-4) was investigated in the intact rat. Urine was collected for 24 hr following intraperitoneal administration of the drug. A metabolite of TMB-4 was isolated from the urine and characterized as trimethylene-1-(4-aldoximinopyridinium)-1′-(4-cyanopyridinium) ion by ethanol extraction, charcoal adsorption chromatography, ion exchange chromatography, paper chromatography, and paper electrophoresis. The reaction mechanisms involved in the biochemical pathways for conversion of TMB-4 to the dibromide of the identified ion may include acetylation of the oximino group in the liver, a reaction similar to that which occurs with pralidoxime. TMB-4, like pralidoxime and many other quaternary ammonium compounds, appears to be rapidly excreted in the urine.

73-0920. Stevens, J. T.; Stitzel, T. E.; McPhillips, J. J. (Dept. of Pharmacol., West Virginia Univ. Med. Cent., Morgantown, WV). **Effects of anticholinesterase insecticides on hepatic microsomal metabolism.** *J. Pharmacol. Exp. Ther. 181(3): 576-583; 1972.* (29 references)

The effects of parathion, paraoxon, malathion, disulfoton, carbaryl, and schradan on hepatic drug metabolizing enzymes were examined in vivo and in vitro. At 1/2 the LD50 all but schradan increased the duration of hexobarbital sleeping time in the mouse. The increase did not appear to be due to ChE inhibition or to an altered sensitivity of the brain to barbiturate. All but schradan also inhibited hexobarbital metabolism in vitro, paraoxon the most. Paraoxon and the other inhibitors of hexobarbital metabolism inhibited ethylmorphine *N*-demethylation in mouse, but paraoxon enhanced the hydroxylation of aniline while parathion, malathion, disulfoton, and carbaryl inhibited the reaction. Kinetics of these reactions varied with the insecticide used. Preliminary work with human microsomes indicates that malathion, carbaryl, disulfoton, and parathion all inhibit aniline hydroxylation. The LD50 of carbaryl in mice decreased from 145.5 to 93.0 mg/kg after 1 hr pretreatment with tolbutamide. The LD50 decreased to 108 mg/kg after similar pretreatment with bis-hydroxycoumarin, another drug commonly used in clinical medicine.

73-0921. Sanjuan, M. A.; Cortada Font, A. M.; Grasa Jordan, M.; Dominugez Arranz, M. (Catedra de Farmacol. y Terapeutica General, Zaragoza, Spain). **Estudio experimental de la intoxicacion por DDT. [An experimental study of DDT poisoning.]** *Med. Esp. 67: 201-205; 1972.* (6 references) (Spanish)

DDT-induced histopathology was studied in albino rats killed by inhalational exposure to DDT-saturated air or intragastric administration of 2.5 ml of the compound. An acute inflammatory response involving the stomach and lung was observed in both groups of rats. Kidney preparations exhibited tubular obstruction, enlargement of Bowman's capsules, and a large number of interstitial hemorrhages; the liver had severe degeneration of the parenchymal cells and large numbers of Kupffer cells within the sinusoids; and the spleen revealed reticuloendothelial system hypertrophy. Inflammatory infiltrations below the epithelial layers of the stomach, disseminated hemorrhages in the liver, and kidney and spleen alterations (similar to those in rats poisoned by inhalational DDT exposure) occurred in the intragastrically-treated animals. Exposure to orciprenaline aerosol-saturated atmosphere after DDT inhalation decreased the extent of lung hemorrhages and inflammatory infiltrations and prevented the fatty and glycogen degeneration processes as well as the inflammatory infiltrations and hemorrhages in the liver.

73-0922. Gleyberman, S. Ye.; Voronkina, T. M. (All-Union Sci. Res. Inst. Disinfec. Steril., Moscow, USSR). **Izucheniye vsasyvaniya repellenta dietiltoluamida. [Study into the resorption of the repellant diethyltoluamide.]** *Med. Parazitol. Parazit. Bolez. 41(2): 189-197; 1972.* (16 references) (Russian)

The resorption of diethyltoluamide (LD50 of 3,500 mg/kg), applied in concentrations of 8-20 mg/cm^2 to the intact skin of rabbits, guinea pigs, and albino mice, was studied. Fast resorption of diethyltoluamide through the skin, penetration through the blood-brain and placental barriers, and varying degrees of absorption by all organs, especially by the brain and the adrenal gland, were determined. The concentration in the blood was determined by the combination of the processes of resorption, absorption, and reabsorption by tissues and organs, excretion, and probably by partial decomposition within the organism. The determining factor in the pathogenesis of diethyltoluamide poisoning as a structurally nonspecific substance consists in progressive, irreversible accumulation. The resorption of diethyltoluamide through the skin has specific and individual features. The rate and extent of resorption are determined by the ambient temperature and by the presence and nature of solvents and film-forming agents. Diethyltoluamide is eliminated from the organism predominantly in the urine.

73-0923. Ashwood-Smith, M. J.; Trevino, J.; Ring, R. (Dept. of Biol. Sci., Univ. of Victoria, Victoria, British Columbia, Canada). **Mutagenicity of dichlorvos.** *Nature 240(5381): 418-420; 1972.* (9 references)

Out of 17 organochlorines, organophosphates, nitro compounds, and other pesticides tested, only captan and dichlorvos were mutagenic in an assay using an auxotrophic mutant of *Escherichia coli*. This bacterium can mutate to prototrophy either by true reverse mutation at the tryptophan locus or by the induction of ochre suppressors. Plated cells were incubated to develop a lawn of bacterial growth, and in the

case of dichlorvos, a Vapona strip was cut up and a 20 mm^2 piece placed on the incubated plate. A zone of growth inhibition developed around the Vapona piece and induced mutants appeared in a ring around the strip and beyond the inhibition zone. Dichlorvos increased the mutant yield by a factor of about three in two experiments and by a factor of six in a third test. These values are underestimates since no attempt was made to correct for the growth inhibition.

73-0924. Kataoka, S.; Kawasaki, T.; Shimoda, R.; Takahama, K.; Kanda, M. (Kumamoto University, Japan). **[Effects of organomercury pesticides and organophosphorus pesticides on the tissue respiration of rat's brain.]** *Nippon Hoigaku Zasshi (Jap. J. Leg. Med.) 26(5): 380-381; 1972.* (Japanese)

Effects of organomercury pesticides (ethylmercury phosphate and phenylmercury acetate) and organophosphorus pesticides (malathion EC and parathion EC) on the respiration of slices of the cerebral cortex of rats were studied in vitro and in vivo. A slice of the cerebral cortex of a decapitated male Wistar rat was incubated in a Warburg flask containing one of the pesticides and a buffer solution maintained under aerobic conditions at 37°C for one hour and the oxygen and sugar consumption and lactic acid formation studied. The oxygen consumption was inhibited as the concentration of the pesticide was increased and most highly inhibited by ethylmercuryphosphate, phenylmercury acetate, and organophosphates. No difference was found between parathion and malathion. The sugar consumption and lactic acid formation also were parallel. In vivo experiments were carried out by the same method as above; however, the slice of cerebral cortex was taken during the peak of acute symptoms caused by oral administration of the pesticide at a rate of 8-10 times the LD50. The oxygen consumption was slighly accelerated (about 6-10%) by the two organomercury pesticides and parathion and slightly inhibited by malathion as compared to control. It is thought that the organomercury pesticides are cytotoxic to brain.

73-0925. Avrahami, M.; Steele, R. T. (Wallaceville Anim. Res. Cent., Dept. of Agr., Private Bag, Upper Hutt, New Zealand). **Hexachlorobenzene. I. Accumulation and elimination of HCB in sheep after oral dosing.** *N. Z. J. Agr. Res. 15(3): 476-481; 1972.* (5 references)

Hexachlorobenzene (HCB) administered orally to sheep rapidly accumulated in the omental fat, particularly during the first week of dosing. Maximum concentrations observed in fat over the 18 wk dosing period were 0.9 ppm, 7.5 ppm, 75 ppm, and 650 ppm for sheep given daily (Mon. through Fri.) doses of 0.1, 1.0, 10, and 100 mg HCB respectively. Daily doses were equivalent to 0.1 to 100 ppm in the feed, and it was concluded that sheep would store HCB in their body fat to the extent of 7 to 9 times the concentration in the feed at all levels tested. The half-life of HCB in fat, obtained over a 42 wk period, varied between 10 and 18 wk depending on the dose. Whole blood residues generally reflected those of the fat, but were about 1000 times lower in concentration. The growth of animals on all but the 100 mg dose was not affected by HCB, but at 100 mg, the dose expected from feeding treated wheat, the growth rate was about 1/3 that of controls.

73-0926. Avrahami, M.; Steele, R. T. (Wallaceville Animal Res. Cent., Dept. of Agr., Private Bag, Upper Hutt, New Zealand). **Hexachlorobenzene. II. Residues in laying pullets fed HCB in their diet and the effects on egg production, egg hatchability, and on chickens.** *N. Z. J. Agr. Res. 15(3): 482-488; 1972.* (4 references)

Administration of hexachlorobenzene (HCB) in the feed of laying pullets resulted in rapid accumulation of the compound in body fat and egg yolk. Lesser amounts were found in muscle and liver. Tissue concentrations were approximately proportional to each feed level. The HCB storage ratios (fat:feed) were 31, 27, 23, and 21 for feed levels of 0.1, 1.0, 10, and 100 ppm, respectively. To avoid residues in chicken fat in excess of 0.1 ppm, 1 bushel of HCB-treated wheat would have to be mixed with 33,000 bushels of untreated wheat before feeding. Feeding up to 100 ppm HCB resulted in no apparent adverse effects on the health of the pullets or their chicks or on fertility or hatchability of the eggs.

73-0927. Avrahami, M.; Steele, R. T. (Wallaceville Anim. Res. Cent. Dept. of Agr., Private Bag, Upper Hutt, New Zealand). **Hexachlorobenzene. III. The effects of feeding HCB to growing chickens.** *N. Z. J. Agr. Res. 15(3): 489-494; 1972.* (3 references)

Feeding up to 100 ppm hexachlorobenzene (HCB) in the diet of rapidly growing chickens for six months produced no signs of organochlorine intoxication or adverse effects on general health. The fungicide was rapidly accumulated in body fat and, in lesser amounts, in liver and muscle. Equilibrium between storage and elimination of HCB in the tissues was reached during the first or second month of exposure in the groups on the higher dose rates, and equilibrium concentrations were approximately proportional to the concentration in the feed. The fat level to feed level ratio was 31 to 1 in the group fed 0.1 ppm HCB and 20 to 1 in the group fed 100 ppm. Egg production was delayed in the highest dose group, but the effect was not considered significant since there were only three pullets in each group. Egg yolk HCB concentrations were about 1/4 of those in the corresponding body fat. In general, the results are similar to those obtained with laying hens exposed to the same dietary HCB levels. The use of contaminated commercial mash resulted in unusually high initial residues at the lower doses.

73-0928. Oshiba, K.; Kawakita, H. (Osaka Municipal Inst. of Public Health, Osaka, Japan). **[The relationship between toxic substances and nutrition. Part 5. Effects of dietary protein and fat and starvation on excretion of accumulated BHC.]** *Osaka Shiritsu Eisei Kenkyusho Kenyku Hokoku (Rep. Osaka Munic. Inst. Pub. Health) 34: 158; 1971.* (Japanese)

The effects of dietary protein and fat and starvation on the body's ability to excrete β-BHC (chronic poisoning) and γ-BHC (acute poisoning) were examined. Female rats (102 total) were fed 10 ppm of β-BHC and 100 ppm of γ-BHC in the standard laboratory diet for 28 and 14 days, respectively; then a high-protein diet without pesticides or diets containing different amounts of fat were fed for six days. Some groups were starved for six days. The BHC accumulation clearly decreased with increasing amounts of protein; the excretion via the liver was particularly rapid. After administration of a 30% casein diet for 6 days, the accumulated β-BHC in the liver decreased by half. The other organs did not function so effectively. The excretion of γ-BHC from all organs was extremely rapid; the groups on the 5% casein and the 10% casein diet showed a significant difference. The ratio of the β-BHC and γ-BHC excretion rates (β/γ) upon administration of a 5% casein diet was approximately 1/3 to 1/70; upon administration of a 30% casein diet, it ranged from 1/2 to 1/5. During the six days of starvation, 70 to 90% of the accumulated γ-BHC was discharged. Starvation did not increase excretion of β-BHC; in some organs, the amount of β-BHC increased due to mobilization and transfer from the fat adipose tissue.

73-0929. Hashimoto, Y.; Makita, T.; Nishibe, T.; Mori, T.; Noguchi, T.; Ohta, G. (Bio-Med. Res. Div., Nisso Inst. for Life Sci., Nippon Soda Co., Ltd., Oiso, Kanagawa, Japan). **Chronic oral toxicity studies of DAEP, *O,O*-dimethyl *S*-2-(acetylamino)ethyl dithiophosphate (active ingredient of Amiphos) in Sprague-Dawley strain rats.** *Oyo Yakuri (Pharmacometrics) 6(6): 1189-1205; 1972.* (4 references)

A two year oral toxicity study of Amiphos in rats indicated that the no effect level is 80 ppm; above this microscopic changes were noted in the thyroid, and erythrocyte ChE and serum ChE were noticeably depressed. Growth retardation was observed in both sexes at the highest dose level of 2000 ppm and at the 400 ppm level in male rats. Signs of intoxication were produced only during the early stage of the highest dose level. Mortality observed was believed caused by respiratory illness. Hematological studies including renal and hepatic function tests indicated no abnormalities; results of gross necropsy of the animals were unremarkable. However, mild to moderate degree of swelling of follicular epithelium, follicular atrophy, and reduction of stainability of colloidal substances were observed in some rats of the 400 and 2000 ppm groups. No significant difference in the incidence of tumors was apparent between control and treated animals.

73-0930. Raymond, D. D.; Alexander, M. (Lab. of Soil Microbiol., Dept. of Agronomy, Cornell Univ., Ithaca, NY 14850). **Cleavage of the ether bond of phenylmethyl ethers by enzymes of *Arthrobacter* sp.** *Pestic. Biochem. Physiol. 2(3): 270-277; 1972.* (11 references)

The mechanism of cleavage by microorganisms of pesticidal ethers such as 2,4-D and other ethers present in soil was studied using a strain of *Aerobacter* capable of growing on *m*-methoxybenzoate. This bacterium oxidized *m*-hydroxybenzoate, vanillate, and gentisate without a lag phase, suggesting that they are intermediates in *m*-MBA degradation. Cells grown on *m*-hydroxybenzoate induced enzymes which immediately oxidized gentisate, and cells grown on vanillate oxidized protocatechuate without a lag phase. Protocatechuate-metabolizing enzymes were not induced by growth on either *m*-MBA or *m*-hydroxybenzoate. Formaldehyde and the *meta*-hydroxy compounds were the products of enzymatic cleavage. The cleavage reaction required oxygen and reduced pyridine dinucleotide; essentially all of the activity of a crude cell-free extract was recovered in the soluble fraction.

73-0931. North, H. H.; Menzer, R. E. (Dept. of Entomol., Univ. of Maryland, College Park, MD 20742). **Biotransformation of dimethoate by cell culture systems.** *Pestic. Biochem. Physiol. 2(3): 278-285; 1972.* (17 references)

After labeled dimethoate was incubated for 48 hr in mouse fibroblast L-929 cell culture, 35% of the radioactivity was determined as the dimethoate carboxylic acid and 65% was unchanged dimethoate. Since no oxidation was seen and the rate of conversion was low, these cells do not appear to be useful for the study of dimethoate metabolism. In contrast, sonicated human embryonic lung (HEL) cells with cofactors metabolized all of the added dimethoate during a 3 hr incubation. Over 95% of the recovered radioactivity resulted from oxidative metabolites and no metabolism took place without NADPH. The same products of oxidation were obtained using intact HEL cells and the rate was relatively rapid. The sequence of reactions was similar to that found in rats although the ratio of products was reversed. Dimethoate was desulfurated to yield dimethoxon and both compounds were *N*-demethylated.

73-0932. Appleton, H. T.; Nakatsugawa, T. (Dept. of Forest Entomol., State Univ. College of Environ. Sci. and Forestry, Syracuse, NY 13210). **Paraoxon deethylation in the metabolism of parathion.** *Pestic. Biochem. Physiol. 2(3): 286-294; 1972.* (21 references)

Monoethyl paraoxon was definitely identified as

the major product of parathion metabolism in several strains of rat. Radiometric, chromatographic, and IR analyses were used to identify the metabolite. The same product was isolated from urine of rats treated with paraoxon, but it represented less than the total deethylation of paraoxon. Monoethyl paraoxon was only partially excreted by rats while diethyl phosphoric acid was totally recovered in the urine. *O*-dealkylation may be more important than formerly believed as a pathway of degradation of *O,O*-diethyl phosphate triesters.

73-0933. Crayford, J. V.; Hutson, D. H. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The metabolism of the herbicide, 2-chloro-4-(ethylamino)-6-(1-cyano-1-methylethylamino)-*s*-triazine in the rat.** *Pestic. Biochem. Physiol. 2(3): 295-307; 1972.* (19 references)

Urinary metabolites recovered following administration of ^{14}C-ring or ^{14}C-ethyl labeled Bladex in rats were primarily mercapturic acids resulting from *N*-desethylation and conjugation with glutathione. The feces contained about 50% of the administered ring label in the form of 10 metabolites. The major fecal metabolite was 2-hydroxy-4-(ethylamino)-6-(1-carboxy-1-methylethylamino)-*s*-triazine. This compound and glutathione conjugates made up the major portion of metabolites leaving the liver via the bile. The glutathione transferase which catalyzes the transfer of the triazinyl group from the 2-chlorotriazine to glutathione was traced to the liver cytosol. It appeared in similar concentrations in rat, mouse, and rabbit liver.

73-0934. Verschoyle, R. D.; Barnes, J. M. (MRC Toxicol. Unit, Med. Res. Council Lab., Woodmansterne Rd., Carshalton, Surrey, England). **Toxicity of natural and synthetic pyrethrins to rats.** *Pestic. Biochem. Physiol. 2(3): 308-311; 1972.* (14 references)

Oral and intravenous toxicities of several natural pyrethrins and five synthetic analogs were compared in the rat. Pyrethrin I had an oral LD50 of 260 to 420 mg/kg while one of the analogs had a corresponding value of >8000 mg/kg. Tremors, increased sensitivity and aggressiveness, convulsive twitching, prostration, coma, and death were observed at doses near the LD50 between 3 and 24 hr after administration. All deaths occurred within 20 min after intravenous injection of the pyrethrins and 20-60 min after i.v. injection of most of the synthetic analogs. Relatively shortlived effects were observed in survivors, suggesting a rapid detoxication of pyrethrin.

73-0935. Shah, P. V.; Dauterman, W. C.; Guthrie, F. E. (Dept. of Entomol., North Carolina State Univ., Raleigh, NC 27607). **Penetration of a series of dialkoxy analogs of dimethoate through the isolated gut of insects and mammals.** *Pestic. Biochem. Physiol. 2(3): 324-330; 1972.* (18 references)

The penetration of a series of dialkoxy analogs of dimethoate through mouse gut and the gut of insects in vitro followed first-order kinetics. The half-time penetration rates of dimethoate (methyl analog) were about 2-fold slower in the gut than in measurements made from studies on integument. An increase in the extent of penetration was observed with increasing polarity. The correlation was greatest in *M. sexta* and *B. cranifer* while in mouse there was an interchange of effects between the methyl and ethyl analogs. In all three species less polar components tended to bind more strongly to the gut. The butyl analog was most readily converted to water-soluble products by the gut of the three species. *B. cranifer* gut was most active converting up to 30% of the dimethoate analogs.

73-0936. Hassall, K. A.; Manning, D. (Dept. of Physiol. and Biochem., The University, Reading, England). **Anaerobic metabolism of DDT analogs by pigeon liver preparations.** *Pestic. Biochem. Physiol. 2(3): 331-336; 1972.* (10 references)

Methoxychlor, *p,p'*-DDT, *o,p'*-DDT, dibromo-DT, dimethyl-DT , and diethyl-DT were metabolized upon incubation under anaerobic conditions with 12,000g X 30 min pigeon liver supernatant fraction. The rate of metabolism was sometimes increased by the addition of a NADPH-generating system. In each case only one hexane soluble metabolite was detected. This was found to have a molecular weight 34 units less than that of the parent compounds. Mass spectrum data indicated that fragmentation occurs in such a way as to leave the aromatic part of the molecule intact and positively charged. Isotope patterns in the spectra of each substrate and its metabolite revealed the loss of a chlorine atom in each case. DDD and perthane, two dichloroethane derivatives, were not metabolized. The work showed that methoxy-DD is as readily formed as the highly persistent DDD (TDE) in an in vitro system, suggesting possible environmental advantages of methoxychlor.

73-0937. Beynon, K. I.; Stoydin, G.; Wright, A. N. (Woodstock Agr. Res. Cent., Sittingbourne, Kent, England). **The breakdown of the triazine herbicide cyanazine in wheat and potatoes grown under indoor conditions in treated soils.** *Pestic. Sci. 3(4): 379-387; 1972.* (3 references)

The breakdown of the triazine herbicide cyanazine (Bladex, 2-chloro-4-(1-cyano-1-methylethylamino)-6-ethylamino-1,3,5-triazine) has been studied in spring and winter wheat and potatoes grown under indoor conditions in soils treated at planting with up to 1.5 kg/ha of the radiolabeled herbicide. Breakdown products were mainly those formed by hydrolysis of the cyano group to give an amide and an acid followed by hydrolysis of the chlorine to hydroxyl. De-*N*-alkylation reactions also

occurred although these were less evident in soils. In wheat the chloro acid formed by the desethylation of the acid was more evident than in previous studies with maize. In all of the crops at harvest the residues were mainly of the hydroxy acids 2-hydroxy-4-(1-carboxy-1-methylethylamino)-6-ethylamino-1,3,5-triazine and 2-hydroxy-4-(1-carboxy-1-methylethylamino)-6-amino-1,3,5-triazine. In potatoes and spring wheat they were present in both free and conjugated forms whereas in winter wheat they were almost entirely in conjugated forms. The hydroxyacids are of a low order of toxicity to animals and are not herbicidal. They are unlikely to present a residue hazard if present in field crops. (Author abstract by permission)

73-0938. Vos, R. H. de; Bouwman, J.; Engel, A. B. (Central Inst. for Nutr. and Food Res., TNO, Zeist, The Netherlands). **Residues of organochlorine pesticides in broilers from feed fortified with known levels of these compounds.** *Pestic. Sci. 3(4): 421-432; 1972.* (14 references)

p,p'-DDT, HEOD, endrin, heptachlor epoxide, hexachlorobenzene, and lindane were fed in combination to day-old broiler chickens at 0.05, 0.15, and 0.30 ppm in the feed for about seven weeks. Birds were killed at regular intervals and samples of abdominal fat and other tissues examined for residues of the chlorinated pesticides by gas-liquid chromatography. The lipid content of each sample was determined and the residue levels calculated for the whole tissue and also for the fat contained in the sample. At the end of the seven weeks (when in practice broilers are slaughtered) residues were highest for heptachlor epoxide, followed by hexachlorobenzene, HEOD, DDT (total), endrin, and lindane. Heptachlor epoxide residue levels in fat were 13 times the levels in the feed, for lindane the ratio was 3.3. Fat residues of each pesticide reached a plateau relatively quickly, and these levels were proportional to the fortification rates in the feed. HEOD and *p,p'*-DDT alone were fed to separate groups of birds. No differences in residue build-up of these compounds were found between these groups and the groups that had received these compounds in combination with the other pesticides. The total amounts of each pesticide in the tissues were reduced when the meat was fried, probably by loss of fat during preparation and frying. For *p,p'*-DDT and heptachlor epoxide also smaller residues were observed in the remaining fat after frying. (Author abstract by permission)

73-0939. Studnicka, M. (Inst. of Fish Diseases, Veterinary Dept. WSR, Lublin, Poland). **Badania nad pozostaloscia zwiazku fosfoorganicznego Foschlor w tkankach ryb poddanych leczeniu tym preparatem. [Studies on Foschlor residues in tissues of fishes treated with this organophosphate compound.]** *Pol. Arch. Wet. 13(3): 107-121; 1970.* (22 references) (Polish)

A total of 463 carp (1, 2, or more years of age) were maintained in aquaria of water at 10-16°C or 3-4° and containing 1, 1.3 or 2 ppm Foschlor for 4-5 days or 2% Foschlor for 20 minutes. Foschlor was determined in brain and muscle tissue at different time intervals during exposure and 1-14 days after treatment and transfer to an aquarium with clean running water (9-13°C). Inhibition of enzyme activity was detected at the low concentrations of Foschlor beginning at 18 hours of exposure; after 20 hours all experimental fish showed a decrease in comparison to controls (336 ± 3.19 mg/g/hour). The decrease in enzyme activity after treatment was proportional to concentration and temperature, but the activity returned to normal levels 14 days after exposure regardless of the concentration and temperature used. Residues in muscles of carp exposed to 2% Foschlor were detected by thin-layer chromatography for 9 days and by agar diffusion for 12 days after treatment. Carp should not be eaten for at least 14 days after exposure to Foschlor.

73-0940. Grant, B. F.; Schoettger, R. A. (Fish-Pestic. Res. Lab., Rt. 1, Columbia, MO 65201). **The impact of organochlorine contaminants on physiologic functions in fish.** *Proceedings of the Institute of Environmental Science, 18th Annual Technical Meeting, 1972, pp. 245-250.* (14 references)

Although the best estimates of safe toxicant concentrations for fish have been derived by studying the long-term effects on reproduction, several other types of studies can help evaluate toxicosis. Measurement of factors such as response to the moderate 'loading' stress of exercise; changes in serum cortisol, magnesium, inorganic phosphate, and total protein; liver glycogen levels; serum glucose, osmolality, and cholesterol values; and weight gain correlated with the dose of endrin fed for 163 days in an experiment with trout. Similar results were obtained with dieldrin and aldrin. Altered thyroid activity often indicates organochlorine intoxication. Studies with DDT have shown that organochlorines are taken up both from the water and from the food. When these compounds are mobilized with the fat during periods of fasting and exercise, severe intoxication or death can occur. Measurement of various effects of contaminants on fish can help predict the subtle, adverse impact of these materials on aquatic ecosystems. To do so, effects measured in such investigations must be strongly linked to the inability of the fish to overcome stress, the amounts or rates of contaminant introduced, and the dynamics of the residue within the fish and its habitat.

73-0941. Sethunathan, N.; Yoshida, T. (Dept. of Soil Microbiol., Cent. Rice Res. Inst., Cuttack-6, India). Con-

version of parathion to *para*-nitrophenol by diazinon-degrading bacterium, *Flavobacterium* sp. *Proceedings of the Institute of Environmental Science, 18th Annual Technical Meeting, 1972, pp. 255-257.* (9 references)

Diazinon, ethyl parathion, and Dursban (chlorpyrifos), but not malathion, were readily metabolized by the cell-free extract of a *Flavobacterium* isolated from water of a diazinon-treated rice field. Most of each insecticide was degraded within 30 min. The bacterium evidently has an enzyme system capable of cleaving the P-O-C bond although aminoparathion was not decomposed in this system. Parathion was rapidly decomposed without a 'lag' phase by diazinon-grown cells and cells grown on unamended medium, indicating a constitutive degradation. The major metabolite formed during the bacterial degradation was *para*-nitrophenol. Apparently, it was not further degraded by the organism studied.

73-0942. Letterst, C. L.; Van Loon, E. J. (Lab. of Toxicol., Nat. Cancer Inst., NIH, Bethesda, MD 20014). **Enzyme induction by polychlorinated biphenyls relative to known inducing agents.** *Proc. Soc. Exp. Biol. Med. 141(3): 765-768; 1972.* (18 references)

Induction of several hepatic microsomal enzymes by equimolar amounts of DDT, phenobarbital, and polychlorinated biphenyls (PCBs) fed for 30 days was investigated in the rat. At 150 μmoles/kg of food PCBs consistently produced a greater stimulation in nitroreduction and hydroxylation than DDT or phenobarbital and were approximately twice as active as DDT in stimulating reduction. DDT at the same dose almost doubled the demethylation and reduction rates. At 1.5 and 15 μmoles/kg of food DDT was the most efficient enzyme inducer. An increase in liver weight, protein content of liver microsomes,and microsomal content of cytochrome P-450 was seen with each compound, particularly at the highest dose level.

73-0943. Alumot, E. (Volcani Inst. of Agr. Res., Bet Dagan, Israel). **The mechanism of ethylene dibromide action on laying hens.** *Residue Rev. 41:1-11; 1972.* (21 references)

Residues of ethylene dibromide (1,2-dibromoethane, EDB) administered to laying hens in fumigated mash caused a gradual reduction of egg weight, up to cessation of laying. Growth of the ovarian follicles was affected. To clarify the mechanism of this effect, the following sites of the possible EDB action were investigated: gonadotropic hormone levels, composition of egg yolk, protein pattern in blood serum and yolks, and permeability of the yolk membranes to proteins. The rate of passage of labeled proteins from blood serum to ovarian follicles was reduced to about half of the control value by the treatment with EDB. The uptake/unit membrane area in the EDB group was also about half that of the control. It is assumed that the impaired growth of ovarian follicles induced by EDB is due to changes in permeability of the follicular membrane. (Author abstract by permission)

73-0944. Schlagbauer, B. G. L.; Schlagbauer, A. W. J. (D-4051 Korschenbroich, Raderbroich 140, Germany). **The metabolism of carbamate pesticides—a literature analysis. Part 1.** *Residue Rev. 42: 1-84; 1972.* (279 references)

The metabolism of carbamate pesticides is reviewed on the basis of a literature analysis covering the period up to April 1970. The metabolic pathways of 15 individual compounds are outlined. Literature on the metabolism of fungicidal and herbicidal carbamates is also discussed. A comparison of the metabolism of these carbamates in various organisms shows that hydrolysis, hydroxylation (often connected with desalkylation),and conjugate formation occur in all organisms. The significance of each reaction varies for different compounds and organisms. Hydrolysis is most important in warm-blooded animals, and hydroxylation and glycoside formation predominate in plants and insects. Animals convert carbamates more readily to glucuronides and plants convert them to glycosides. Light, temperature, and pH are among the environmental factors which affect the degradation of carbamates by living organisms. (Author abstract by permission, edited)

73-0945. Schlagbauer, A. W. J.; Schlagbauer, B. G. L. (D-4015 Korschenbroich, Raderbroich 140, Germany). **The metabolism of carbamate pesticides—a literature analysis. Part II.** *Residue Rev. 42: 85-90; 1972.* (11 references)

Literature on carbamate metabolism published between May 1970 and June 1971 is reviewed, supplementing the previous communication (see Abstract no. 73-0944). Specific information on degradation of landrin, formetanate, propoxur, carbaryl, *p*-chlorophenyl *N*-methyl carbamate, and methiocarb (mercaptodimethur) by plants, insects, mammals, soil microorganisms, and single enzyme systems is included. These later studies confirm the previously advanced hypothesis that a variety of metabolites is formed by each system and only the quantitative ratios differ. Hydrolysis is the most important pathway for degradation of *p*-substituted *N*-alkylcarbamates; warm-blooded animals excrete more conjugates of hydrolysis products than of hydroxylation products and hydroxylation predominates in plants. The basic degradation pathways of carbamates appear to be well established.

73-0946. Bull, D. L. (Entomol. Res. Div., Agr. Res. Serv., U. S. Dept. of Agr., College Station, TX 77840). **Metabolism of organophosphorus insecticides in animals and plants.** *Residue Rev. 43: 1-22; 1972.* (100 references)

After introduction into a living animal or plant system, organophosphorus insecticides undergo a variety of biochemical transformations. The general types of reactions that play major roles in the metabolism of these pesticides and others include oxidations, hydrolyses, alkyl or aryl group transfers, reductions, and conjugations. Depending on the nature of the insecticidal substrate and the biochemical event involved, the products of those reactions may either have toxic properties that are comparable to or substantially greater than that of the parent compound, or they may have little or no insecticidal activity. The relative rates of certain enzyme-catalyzed reactions in different organisms can influence the selectivity of compounds and also are commonly implicated in the development of resistance to insecticides in different species. (Author abstract by permission)

73-0947. Seawright, A. A.; Steele, D. P.; Mudie, A. W.; Bishop, R. (Vet. School, Univ. of Queensland, Brisbane, Australia). **The effect of diet and drugs on hepatic microsomal aminopyrine *N*-demethylase activity in vitro and susceptibility to carbon tetrachloride in sheep.** *Res. Vet. Sci. 13: 245-256; 1972.* (21 references)

The effects of DDT and phenobarbitone treatment were investigated on the activity of sheep aminopyrine *N*-demethylase, a good indicator of the state of the hepatic microsomal detoxication mechanism, and on the susceptibility of sheep to carbon tetrachloride. Toxicity of carbon tetrachloride to sheep is higher in animals which have been injected with phenobarbitone. Mean hepatic microsomal aminopyrine *N*-demethylase activity varied between flocks. In Queensland it was higher and more variable in flocks sampled in winter than in flocks sampled in summer. An intraruminal injection of DDT at 200 mg/kg, as well as phenobarbitone treatment, significantly elevated aminopyrine *N*-demethylase levels. With DDT the enzyme levels were more sustained but returned to predosage levels within two months. A 7-to 9-fold increase in susceptibility of sheep to carbon tetrachloride coincided with increased enzyme activity of liver homogenates following drug treatment. A 3- to 4-fold increase in susceptibility was observed when animals were fed a high protein diet. Treated sheep were deprived of food and water for 24 hr before dosing with carbon tetrachloride; nearly all died within 48 hr. The LD50 for carbon tetrachloride in this experiment appeared to be >0.06 mg/kg. This dose caused a drop in enzyme activity when administered to animals pretreated with phenobarbitone. Unexplained mortalities in the field could be due to this lowering of the detoxication mechanism or to increased susceptiblility to carbon tetrachloride.

73-0948. Reis, C. C. A.; Pellegatti, I.; Oga, S.; Zanini, A. C. (Fundacao de Amparo a Pesquisa do Estado de Sao Paul, Sao Paulo, Brazil). **Atividade toxica e/ou teratogenica de drogas anticolinesterasicas. I. Atividade teratogenica de paration em embrioes de galinha. [Toxic and/or teratogenic activity of anticholinesterase compounds. I. Tetatogenicity of parathion in chicken embryos.]** *Rev. Farm. Bioqui,. Sao Paulo 9(2): 343-355; 1971.* (15 references) (Portuguese)

Embryonated chicken eggs were inoculated on the 4th, 8th, or 12th day of development with parathion in 0.025 ml of corn oil at 59.23, 118.46, or 296.15 μg/egg. Macroscopic and histologic examination (hematoxylin-eosin staining) at hatching time revealed dose dependence in the intensity of malformations. Embryos treated with the highest dose of parathion on the 8th day of development showed total body malformation, overall edema, ankylosis of the lower limbs, asymmetric implantation of the limbs, and intestinal atony. Cellular degeneration and replacement of normal parenchymal tissues by fibrous tissue were seen in most of the histologic preparations. Embryos from eggs inoculated with 59.23μg parathion exhibited only limb malformations but showed the highest teratogenicity yields (76.4%) when inoculated on the 12th day of development. The highest dose inoculated group showed a maximum incidence of teratogenic effects (44%) with treatment on the 8th day of embryogenesis.

73-0949. Molnar, V. (Dept. Legal Med., Tirgu-Mures Med. Pharm. Sci. Inst., Tirgu-Mures, Rumania). **Simptomatologia si morfopatologia intoxicatiei experimentale cu erbicidul atrazin. [Symptomatology and pathomorphology of experimental poisoning with atrazine.]** *Rev. Med. (Tirgu-Mures) 17(3-4): 271-274; 1971.* (16 references) (Rumanian)

The acute and subacute toxicity of atrazine was studied in rats after intragastric administration at 0.6 or 3g/kg. Acute treatment produced pruritis at 10 min; lassitude, increased salivation, and enhanced respiration rate at 30 min; and death in 6% of the rats 6 hr after administration of the compound. Cyanosis and dyspnea developed during the following hours, causing death in 25% of the remaining rats 24 hours after treatment. The rats which died 6 hr after treatment presented lung edema with extensive hemorrhagic foci, cardiac dilatation, and macroscopic hemorrhages in the liver and spleen. Most of the administered atrazine was found in the stomach and small intestine. Rats which died during the second day after treatment showed distinct signs of hemorrhagic bronchopneumonia. Histological examination revealed leukocytic infiltration in various stages of pneumonia along with hemorrhage in all the parenchymal organs, with kidneys presenting dystrophic changes of the tubular mucosa. Rats, sacrificed 24 hr after treatment, had cerebral edema. Histochemical alterations of the liver included the occurrence of alkaline phosphatase in the peripheral portion of the lobes and its gradual disappearance from the hepatocellular nuclei; and gradual disappearance of acid phosphatase from the cellular protoplasm with appearance in the cell nuclei.

Three weeks of subacute treatment caused pathomorphological features characteristic of subacute hepatitis and irritation of the bronchial mucosa.

73-0950. Szocs, J.; Molnar, V.; Balogh, E.; Kincses-Ajtay, M. (Dept. Toxicol., Tirgu-Mures Med. and Pharmaceut. Sci. Inst., Tirgu-Mures, Rumania). **Data experimentale privind toxicitatea erbicidului linuron. [Experimental data on the toxicity of linuron.]** *Rev. Med. (Tirgu-Mures) 17(3-4): 297-301; 1971.* (17 references) (Rumanian)

Dynamics of linuron poisoning in male white rats were studied. Serum and liver enzyme activities, serum protein fractions, and liver glycogen and fatty infiltration levels were examined 2, 6, 12, 24, and 48 hours after a single intragastric administration of linuron at 3000 mg/kg. Serum and liver aldolase activities decreased 6 hr after linuron administration, but rose above the normal levels by the end of the experiment. Liver succinate dehydrogenase decreased by 46% 24 hr after treatment. Serum GOT and GPT increased slightly at 2 hr but dropped 46% below the normal levels 48 hr after treatment. A rise in liver GOT during the first 24 hr was followed by a decrease through the end of the experiment; no changes in GPT were observed. Whole blood catalase decreased during the first 24 hr but rose above the normal levels by the end of the experiment. Blood cholinesterase decreased by 29% during the first 12 hr, then rose slightly within 24 hr. Liver glycogen exhibited decreasing trends during the first 12 hr after acute poisoning; hepatocellular fatty infiltration occurred at 2 hr, increased considerably by 12 hr, and persisted through the end of the experiment. Serum proteins presented a significant decrease in albumin, compensated by increased globulin fraction levels 2 hr after treatment; a 6% albumin increase and a 15% gamma-globulin decrease were observed 24 and 48 hr after the beginning of the experiment.

73-0951. Nanjo, Y. (Dept. of Chemicals for Plants, Shionogi Pharmaceutical Co., Ltd., Osaka, Japan). **[An introduction of a new agrochemical: Rooting grafts of useful trees with Oxyberon.]** *Ringyo To Yakuzai (Forest. Forest Chem.) 41: 11-15; 1972.* (5 references) (Japanese).

Three formulations of indolebutyric acid, Oxyberon solution (a.i. 0.4%), Oxyberon dust 0.5 (a.i. 0.5%), and Oxyberon dust 1.0 (a.i. 1.0%) are registered in Japan for rooting grafts of useful trees. The acute oral toxicity of indolebutyric acid was LD50 = 1,760 mg/kg body weight in mouse; LD50 > 5,000 mg/kg of body weight in rat. Fish toxicity to young carp was: LC50 (24 hr) = 320-180 ppm; LC50 (48 hr) = 180 ppm.

73-0952. Conney, A. H.; Burns, J. J. (Dept. of Biochem. and Drug Metabolism, Hoffmann-LaRoche Inc., Nutley, NJ 07110). **Metabolic interactions among environmental chemicals and drugs.** *Science 178(4061): 576-586; 1972.* (188 references)

The numerous ways in which environmental chemicals that alter microsomal enzyme activity may interact with drugs are reviewed. Organochlorine insecticides often stimulate metabolism of drugs and steroids in persons with occupational exposure. However, the magnitude of the effects suggests that the extent of possible changes in these areas in the general population would be small. Piperonyl butoxide inhibits the activity of mammalian microsomal enzymes, but in man 0.7 mg/kg (a dose 50 times greater than daily exposure by individuals spraying this compound) does not influence antipyrine metabolism. Animal studies indicate that microsomal enzyme inducers like phenobarbital can be useful in decreasing the toxicity of insecticides. Properties of body steroids have been altered in animals and in man by inducing steroid hydroxylation with organochlorines. Enhancement of the metabolism of endogenous estrogens may be responsible for the decline of some species of birds, and adverse effects of such compounds as DDT have been observed on animal reproduction. Vitamin metabolism can also be altered by microsomal enzyme inducers.

73-0953. Murakami, M.; Fukami J.; Fukunaga, K. (Inst. of Phys. and Chem. Res., Wako, Saitama Prefect., Japan). **[Effects of chlorphenamidine on cultured cells.]** *Seikagaku (Biochemistry) 44(9): 496; 1972.* (Japanese)

The biological effects of chlorphenamidine [*N'*-(4-chloro-*O*-tolyl)-*N,N*-dimethyl-formamidine] on HeLa cells in culture were examined. Inhibitory effects on cell proliferation and on the biosynthesis of protein and nucleic acid were sought as indicators of toxicity at the cellular level and to provide information on the mechanism of action. After the HeLa cells had been in contact with chlorphenamidine for two hours, the uptake of ^{14}C-labeled precursors of protein and nucleic acid was followed to determine the effect on the synthesis of RNA, DNA, and protein. At a chlorphenamidine concentration of $10^{-4}M$ the synthesis of RNA was slightly inhibited; however, synthesis of DNA and protein was not inhibited. At $10^{-3}M$ RNA synthesis was reduced to 30% of the control level, and the latter two were reduced to 50-60% of control, indicating that the toxicity of chlorphenamidine is fairly low and RNA is most readily affected. The toxicities of chlorphenamidine degradation products (monodemethyl chlorphenamidine, *N'*-(4-chloro-*O*-tolyl) formamidine and 4-chloro-*O*-toluidine) to HeLa cells were determined by treating cell cultures for five days with the respective compound and determining the protein content in the cells. It was found that the most extensively degraded compound, 4-chloro-*O*-toluidine, showed the weakest inhibitory activity for cell proliferation, suggesting that the more rapid the degradation of chlorphenamidine in living organisms, the slighter the toxicity.

73-0954. Matsueda, K.; Nagaki, M.; Tsukada, N.; Kudo, N.; Uchiyama, M. (Hirosaki Univ., Hirosaki, Japan). **[On the variation of GSH and ChE in organophosphorus pesticide intoxicated pigs' serum.]** *Seikagaku (Biochemistry) 44(9): 722; 1972.* (1 reference) (Japanese)

Observations sere made on variations in ChE and GSH levels in persons with organophosphate intoxication. Serum ChE activity of patients intoxicated by methylparathion was lower than that of healthy persons; intravenous administration of glutathione (GSH) to the intoxicated patients restored the serum ChE activity. A definite parallel existed between the patterns of variation of erythrocyte ChE and erythrocyte GSH under loading with GHS. Using these findings and considering the distribution of serum ChE, aromatic esterase, and carboxyl esterase in mammals, the authors determined the inhibition of serum ChE activity in pigs. Studies monitored the enzymatic histochemical changes and the recovery of blood ChE, inhibited by methyl- and ethylparathion, upon addition of GSH. The findings were examined and applied to treatment against organophosphorus pesticide intoxication in humans.

73-0955. Egberts, J.; Roos, J.; Beijer, H. J. M. (Inst. of Vet. Pathol., TNO, Utrecht, The Netherlands). **The toxicity of TMTD in Japanese quail, an experimental study.** *TNO-Nieuws 27(10): 594-598; 1972.* (16 references)

Fifty ppm of thiram administered in the diet for 11 weeks impaired reproduction in Japanese quail and caused diarrhea and a significant increase in the percentage of granulocytes in hens. Reproduction was affected by the lower shell thickness (-14%), soft-shelled eggs, and decreased fertility and hatchability caused by thiram. The ultrastructure of the palisade layer in the thiram eggs was different from the control egg; there was a decrease in the diameter of the holes. Impaired ventilation could account for reduced hatchability. Shell thickness was significantly higher at 2 ppm dietary thiram than in controls. Chickens fed 50 ppm for several days laid eggs prematurely. Experiments with egg-containing uteri of thiram treated hens showed a decreased contraction ability for 8-lys-vassopressine. The compound may upset the adrenergic/cholinergic equilibrium in the uterus.

73-0956. Vos, J. G.; Botterweg, P. F.; Strik, J. J. T. W. A.; Koeman, J. H. (Inst. of Vet. Pathol., TNO, Utrecht, The Netherlands). **Experimental studies with HCB in birds.** *TNO-Nieuws 27(10): 599-603; 1972.* (23 references)

Chronic toxicity studies of hexachlorobenzene (HCB) with Japanese quail and kestrels revealed a number of sublethal effects. In the feeding study with Japanese quail all birds on 2500 and 500 ppm died within one month. Effects included weight loss, drooping wings, ruffling of the feathers, tremor, ataxia, and paralysis. All but one bird died in the 100 ppm group. The hatchability of fertile eggs was reduced significantly at 20 ppm. Discernible liver damage and increased fecal excretion of coproporphyrin occurred at 5 ppm. Similar results were obtained and a no effect level was established at 1 ppm from a second study with Japanese quail. In the kestrel experiment the male bird of the 200 ppm dose level died after 62 days. Weight loss, ruffling of the feathers, and tremor were observed. Neither gross pathology nor chemical porphyria were seen. Levels of HCB in livers of treated birds were similar to those in birds of prey found dead or dying in the field.

73-0957. Oseid, D.; Smith, Jr., L. L. (Dept. of Entomol., Fish., and Wildl., Univ. of Minnesota, St. Paul, MN 55101). **Swimming endurance and resistance to copper and malathion of bluegills treated by long-term exposure to sublethal levels of hydrogen sulfide.** *Trans. Amer. Fish. Soc. 101(4): 620-625; 1972.* (7 references)

Young-of-the-year bluegills exposed to 0.0004 mg/l. of hydrogen sulfide for 126 or 148 days showed a significantly longer survival time when exposed to 0.075 mg/l. malathion than controls. Higher levels of hydrogen sulfide did not significantly affect survival time with malathion. Resistance to copper was increased by exposure to hydrogen sulfide at all levels. Increased swimming endurance was observed in fish exposed to 0.0004 mg/l., but fish exposed to higher levels of hydrogen sulfide had progressively lower endurance than controls. An increase in gill irrigation rate noted with hydrogen sulfide exposure suggests decreased efficiency in oxygen uptake or transport.

73-0958. Grzenda, A. R.; Taylor, W. J.; Paris, D. F. (Environ. Protect. Agency, Nat. Environ. Res. Cent., Corvallis, Southeast Water Lab., Athens, GA 30601). **The elimination and turnover of ^{14}C-dieldrin by different goldfish tissues.** *Trans. Amer. Fish. Soc. 101(4): 686-690; 1972.* (13 references)

In goldfish fed ^{14}C-dieldrin at 6.1 nmoles for 64 days and then fasted, a rapid loss of labeled dieldrin occurred during the first two weeks, followed by little subsequent reduction. A second group of fish, fed uncontaminated diet after removal of the diet containing ^{14}C-dieldrin, eliminated the contaminant at about the same rate from all tissue, but more slowly than those in the fasted group. Relatively rapid reductions in ^{14}C activity ranging from 62% in skin to 100% in spleen, immature ovary, and mesenteric adipose tissue were observed in fish transferred to diets containing ^{12}C-dieldrin. No detectable cyclodiene degradation was found during the investigation. The data reported suggests that fat solubility or adsorptivity may not be the most important factor in accumulation of organochlorines in fish.

73-0959. Hiltibran, R. C. (Illinois Natural History Survey, Urbana, IL). **The hydrolysis of adenosine triphosphate by bluegill liver mitochondria in the presence of 2,4,5-T and silvex derivatives.** *Trans. Ill. State Acad. Sci. 65(1/2): 51-57; 1972.* (7 references)

Results of an investigation of the effects of several phenoxy herbicides on ATP hydrolysis by bluegill, in the presence of cadmium, zinc, manganese, magnesium, and calcium suggest that some of these derivatives can alter ATP hydrolysis and might affect oxidative phosphorylation in the presence of magnesium. In the presence of cadmium and zinc, all forms of 2,4,5-T and silvex tested except the sodium salt inhibited hydrolysis of ATP. Hydrolysis was increased in the presence of manganese by the butyl ester of 2,4,5-T and the butoxyethanol and propylene glycolbutylether esters of silvex. The butyl ester of 2,4,5-T and the butoxyethanol ester of silvex increased hydrolysis with calcium. All derivatives used except the sodium salts increased the hydrolysis of ATP in the presence of magnesium.

73-0960. Kurinnyy, A. I.; Kondratenko, T. I. (All-Union Sci. Res. Inst. Pesticide, Polymer and Plastics Hyg. and Toxicol., Kiev, USSR.) **Vliyaniye nekotorykh fungitsidov (proizvodnykh ditiokarbaminovoy kisloty) na khromosomy kletok kostnogo mozga myshey. [Effects of some fungicides (dithiocarbamic acid derivatives) on chromosomes of bone marrow cells in mice.]** *Tsitol. Genet. 6(3): 225-228; 1972.* (17 references) (Russian)

The effects of thiram, ziram, zineb, and maneb on bone marrow cell chromosomes were studied in albino mice. The maximum frequency of chromosomal aberrations was found 24 hr after oral administration of thiram. The frequencies of aberrant metaphases 24 hr after the oral administration of 20, 100, and 1,000 mg/kg doses of thiram were 1.14, 3.9, and 7.83%, another 100 mg/kg dose administered intra-abdominally caused 9.5% of aberrant metaphases. The frequencies of chromosomal aberrations produced by 100 mg/kg doses of ziram, maneb, and zineb were 3.13, 1.80, and 1.40%. Chromatid breaks generally indicated chromosomal aberrations.

73-0961. Hjorth, N.; Jorgensen, G.; Trolle-Lassen, C. (Dermatologisk Afdeling, Kobenhavns Amts Sygehus I Gentofte, Copenhagen, Denmark). **Scabies. Behandling med gamma-heksaklorcykloheksan. [Treatment of scabies with gamma-hexachlorocyclohexane.]** *Ugeskr. Laeger 134(22): 1166-1167; 1972.* (8 references) (Danish)

Forty-two patients with scabies were treated with a hand lotion containing 1% of gamma-hexachlorocyclohexane (γ-BHC, lindane). The preparation was rubbed into the skin in a very thin layer and washed off after 24 hr. Reinfection or recurrence occurred in one out of the forty cases which were followed up. No poisoning symptoms were detected. An application period of 8 hr would suffice provided the treatment is repeated after five days. The hand lotion with lindane has a pleasant odor and lindane in particular is the least toxic and least allergenic of the BHC isomers. The lotions should be dispensed in small quantities because of the tendency of lindane to degrade to more toxic isomers during storage.

73-0962. Shtenberg, A. I.; Torchinskiy, A. M. (Inst. of Nutrition, Acad. of Med. Sci. of USSR, Moscow, USSR). **O vzaimosvyazi obshchetoksicheskogo, embriotoksicheskogo i teratogennogo deystviya postotonnikh dyla organizma khimicheskikh veshchestv i vozmozhnosti prognozirovaniya vliyaniya ikh na antenatal'nyy period ontogeneza. [Relationships between general toxic, embryotoxic, and teratogenic effects of exogenous chemicals and the possibility of predicting their influence on antenatal ontogenesis.]** *Vestn. Akad. Med. Nauk SSSR 27: 39-46; 1972.* (33 references) (Russian)

Pregnant Wistar rats were treated with different doses of benomyl and carbaryl during the first 20 days of pregnancy to determine their embryotoxic and teratogenic effects and a possible relationship between these effects. The LD50 values of benomyl and carbaryl are > 10,000 mg/kg and ca. 500 mg/kg, respectively. The frequency of fetal anomalies due to oral benomyl doses of 500, 250, and 125 mg/kg ranged from 100% to 9.6%, dependent on both the dose and the timing of administration. Encephalocele, hydrocephalus, microphthalmia, and anophthalmia were among the anomalies observed. Teratogenic effects were always lethal. The fetal deaths were results of the teratogenic effect. Reduced doses caused lower mortality rates but increased incidence of anomalies. While carbaryl, administered in oral doses of 106, 53, 10.4, 5.7, and 212 mg/kg, failed to show a distinct teratogenic effect, anomalies such as encephalocele were always associated with a minimum fetal mortality rate of 20-30%. Doses corresponding to 50% of the LD50 at a resorption rate of 40% caused encephalocele and abdominal hernia. The results seem to suggest a low toxicity level of teratogenic preparations in the mother and the fetus, and that the teratogenic effect can be regarded as a specific manifestation of the general toxicity. A definite quantitative relationship between teratogenic and embryotoxic effects is shown.

73-0963. Zharasov, Sh. U. (Kazakh Inst. Plant Protection, Alma-Ata, USSR). **Deystviye gerbitsidov na mikrofloru temno-kashtanovykh pochv v posevakh sakharnoy svekly v uslovyakh Alma-Atynskoy oblasti. [Effect of herbicides on dark chestnut soil microflora under the specific conditions prevailing in the Alma-Ata region.]** *Vestn. Selskokhoz. Nauki (Alma-Ata) 15(2): 25-29; 1972.* (6 references) (Russian)

Field and laboratory tests on the effects of Eptam (EPTC) and Chlorazan on the dark chestnut soil microflora in sugar-beet were studied in field and laboratory

tests. Recommended doses of Eptam and Chlorazan (3 and 4.5 kg/ha each) failed to influence the growth of the soil microflora significantly. The 3 kg/ha doses even had a slight stimulative effect temporarily. Doses of 4.5 kg/ha slightly inhibited actinomycetes. Herbicide residues were detected only in the upper 10 cm soil layer. Doses 4-8 times the recommended expenditure inhibited the growth of the soil microflora, especially of actinomycetes and spore-forming bacteria, in laboratory experiments. Nitrate levels increased in the soil due to large Chlorazan doses.

73-0964. Medvedev, A. N.; Burmistrov, V. F. (Kazakh State Agr. Inst., Alma-Ata, USSR). **Vliyaniye smesey nekotorykh gerbitsidov na biologicheskuyu aktivnost', dinamiku pitatel'nykh veshchestv i vodnyy rezhim pochvy. [The effect of some herbicide mixtures on the biological activity, the dynamics of nutrients, and on the water content in soil.]** *Vestn. Selskokhoz. Nauki (Alma-Ata) 15(2): 88-93; 1972.* (9 references) (Russian)

The effects of picloram-TCA, picloram-dalapon, and 2,4-D-dalapon mixtures on soil microorganisms and nutrient and water balance were studied. These herbicide mixtures stimulated the activity of soil microorganisms and intensified the accumulation of the mobile forms of nitrogen, especially nitrates, and potassium in the soil. Both the moisture content and the temperature in the upper layers of the soil treated with such herbicide mixtures are higher than in mechanically treated soils. Herbicide mixtures containing picloram are more effective for forest plantation than those containing 2,4-D.

73-0965. Gladenko, I. N.; Stuk, L. I. (Ukrainian Sci. Res. Inst. Exp. Vet., Kiev, USSR). **O toksichnosti trolena. [On the toxicity of Trolene.]** *Veterinariya (Moscow) 49(6): 95-96; 1972.* (Russian)

The toxicity of Trolene (ronnel) to albino rats was studied. After determining the LD50 at 3,280 mg/kg, the test animals were given daily 328, 164, 66, 16.4, and 8.2 mg/kg doses of Trolene through gastric tube for 4-6 months. Test animals receiving 328 and 164 mg of Trolene per kg developed clinical symptoms of poisoning (motor irritation, tremor, increased auditory and tactile sensitivity, perspiration, lachrymation, and hypersalivation) within two weeks followed by some deaths in the later course of the experiment. Reduced cholinesterase activity was measured in all groups according to the actual doses given. No clinical symptoms of poisoning in the groups treated with 16.4 and 8.2 mg of Trolene per kg were detected. A Trolene residue content of 1.3 mg/kg in the lung and traces in the kidney was determined. Trolene possesses reduced cumulative capacity with an accumulation coefficient greater than five.

73-0966. Verkhovskiy, A. P. (All-Union Inst. Exp. Veterinary, Moscow, USSR). **Toksicheskoye deystviye triallata na zhivotnykh. [Toxic effect of triallate on animals.]** *Veterinariya (Moscow) 49(6): 97-99; 1972.* (Russian)

The toxicity of triallate to albino mice, rabbits, and sheep was studied. The LD50 values determined (945 mg/kg in albino mice, 500 mg/kg in rabbits) indicate a medium degree of toxicity, the cumulation coefficient being about 10. Triallate inhibits the brain acetylcholinesterase activity and interferes with the function of the central and sympathetic nervous systems; it proved to have neurotropic properties. Acute cerebral hyperemia, chronic hyperemia of the parenchymatous organs, cerebral, subendocardial, and subepicardial hemorrhages, dystrophy and focal necrosis of the liver cells, and hyperplasia of the spleen were determined. Interference of triallate with the nuclein metabolism and with GOT and GPT in sheep was observed.

73-0967. Pesic, V.; Oreskovic, A.; Radovic, L. (Author address not given). **Mogucnost ishrane ljudi mesom zivotninja otrovanih organofosfornim jedinjenjma. [On the possibility of using meat of animals poisoned with organophosphates as food products.]** *Vojnosanit. Pregl. 29(3): 112-116; 1972.* (17 references)

Hogs, lambs, and calves were given single lethal doses of sarin, tabun, armine, soman, edemo, and medemo to determine the organoleptic properties and biological safety of the resulting meats for consumption. The pH of the meat samples (femoral quadriceps muscle) extracted with water in a 1:4 meat/water ratio, dropped slowly during the first 24 hr but reached control levels 48 hr after the death of the animals, indicating that no degenerative processes occurred during this period. Dogs and hens fed poisoned pork and lamb for 60 days had blood cholinesterase activities equal to those fed normal animal meat. The taste, smell, color, and texture of the experimental meat samples did not differ from control samples. Autolytic changes similar to those occurring in the control meat samples were observed after 48 to 72 hr of storage in the refrigerator at 3 to 7°C. Human volunteers (10) consuming meat samples (400 g/day for 30 days) from poisoned calves, hogs, and lambs suffered no blood cholinesterase activity alterations, except for one volunteer who showed a 39% drop after ingestion of pork from a soman-poisoned animal. Blood cholinesterase measurements performed twice daily before and after the meal indicated oscillations of ±20%. The blood erythrocyte and leukocyte counts performed before and at the end of the experiment showed no changes. The thymol turbidity and flocculation tests as well as the aldolase tests showed no functional alterations in the volunteers who ate the poisoned animal meat. Meat from animals poisoned with the above organophosphates was concluded safe for consumption as food.

73-0968. Stevanovic, M.; Golic, M.; Radovic, L.; Pantelic-Vukovic, D.; Maksimovic, M. (Author address

not given). **Biohemija trovanja organofosfornim jedinjenjima. [The biochemistry of poisoning with organophosphorus compounds.]** *Vojnosanit. Pregl. 29(3): 120-127; 1972.* (26 references) (Serbocroatian)

The effects of the chemical composition of organophosphate cholinesterase inhibitors on cholinesterase inhibition and reactivation were investigated. Organophosphates containing fluorine as an acyl substituent are detoxified by rat liver homogenates, in contrast to those with thiocholine as the acyl group. The rapid detoxication of sarin in vivo contrasts with its slow hydrolysis in vitro. The lipid solubility of organophosphates increases with alkyl chain length, and branched-alkyl compounds are more readily fat-soluble than normal-chain alkyl compounds. The high susceptibility of cholinesterase to inhibition by organophosphates compared to other serine group-containing esterases is due to the steric accessibility of some serine groups in cholinesterase. Horse serum cholinesterase-organophosphate interaction kinetics indicated that fluoride-acyl derivatives have the highest and thiocholine-containing organophosphates the lowest inhibition rate constants. The inhibition rate of the enzymes is determined by the electrophilicity of the acyl constituent. The reactivation of cholinesterase by nucleophilic reagents such as oximes depends mainly on the steric position of the groups around the phosphorus. Primary reactions to organophosphates are linked with irreversible esterase inhibition; the secondary reactions are consequences of this inhibition, consisting of accumulation of acetylcholine in the brain and of glucose and ascorbic acid in the blood, as well as a decrease in bound and an increase in free cholesterol.

73-0969. Boskovic, B. (Author address not given). **Uticaj oksima na neuro-muskularni blok izazvan somanom, metil-pinakoliloksi-fosforil-tioholinom i medemom. [The action of oximes on the neuro-muscular block caused by soman, methylpinacolyloxyphosphoryl thiocholine, and medemo.]** *Vojnosanit. Pregl. 29(3): 128-133; 1972.* (19 references) (Serbocroatian)

Soman and medemo (2-ethoxy-dimethylamino-ethyl thiomethylphosphonoxide), beginning at 10^{-7} *M* concentrations, and methylpinacolyloxyphosphoryl thiocholine, starting with 10^{-6} *M* concentrations, generated a neuromuscular block in isolated Wistar rat diaphragms under high frequency stimulation conditions of the phrenic nerve. Treatment with 10^{-5} *M* doses of PAD-Cl (2-pyridine aldoxime dodecyl chloride), 10^{-3}*M* doses of DINA (diisonitrosoacetone), 10^{-4}*M* of DAM (diacetylmonoxime), or 10^{-3}*M* isonitrosine (1-dimethyl-amino-2-isonitrosobutanone-3-hydrochloride) had no effect on this block. Minor block-releasing effects were attained with TMB-4 Cl_2 [1,1′-trimethylene-bis-(4-formylpyridinium chloride)dioxime] and LuH 6[(bis-4-hydroxyiminomethyl-pyridinium (1) methylether) dichloride]. Somewhat more effective were PAM-2Cl and P2-S (pyridine-2-aldoxime methane sulfate). MINA (monoisonitrosoacetone) compensated for the soman-induced block completely (at all tested stimulation frequencies). TMB-4 Cl_2, LuH6, PAM-2Cl, and MINA were highly effective in the recovery from the neuro-muscular block induced by medemo and methylpinacolyloxyphosphoryl thiocholine.

73-0970. Jovic, R. (Author address not given). **Oksigenoterapija u eksperimentalnom trovanju somanom. [Oxygen therapy in experimental soman poisoning.]** *Vojnosanit. Pregl. 29(3): 134-138; 1972.* (12 references) (Serbocroatian)

The efficacy of oxygen therapy alone and in combination with cholinolytic compounds was studied in soman poisoned cats. The lethal dose of i.v. infused soman in anesthetized cats increased by a factor of 1.86 upon forced breathing treatment with a hypoxic mixture of 7% oxygen in nitrogen (I) as compared to natural air breathing. Forced breathing of air (20.8% oxygen) (II) or an oxygen mixture containing 5% carbon dioxide (III) known commercially as carbogen increased the LD100 by factors of 3.08 and 4.64 respectively. Treatment with atropine alone prior to anesthesia (chloral and urethane), increased the LD100 of soman by a factor of 1.82 (spontaneous respiration). Atropine treatment combined with forced breathing of (I), (II), or (III) increased the LD100 by factors of 3.08, 9.14, and 11.4, respectively, compared to the group spontaneously breathing air and without atropine treatment. A combination of cholinolytics, including atropine sulfate with benactizine and pralidoxime, increased the LD100 of soman by a factor of 3.45 under spontaneous breathing conditions. In another experiment, all cats kept under forced breathing of carbogen survived 3.34 LD100 soman whereas those who received combined atropine and forced carbogen breathing resisted 9.26 LD100 of this pesticide.

73-0971. Piscevic, S.; Vojvodic, V.; Duknic, M. (Inst. Technology and Med. Protect. Surg. Dis. Clin. of the Med. Acad., Yugoslavia). **Uzajamno dejstvo sarina i menanicke poyrede sa iskrvavljenjem na prezivljavanje eksperimentalnih zivotinja. [Interaction between sarin and mechanical damage with bleeding in the survival of experimental animals.]** *Vojnosanit. Pregl. 29(3): 155-158; 1972.* (10 references) (Serbocroatian)

The survival of Wistar rats subjected to bleeding trauma (mechanically produced fracture of the femoral bone followed by a partial exsanguination via the femoral artery and vein) and then s.c. dosed with sarin was studied. Sarin administered (in 40μg/kg doses) 30 to 60 seconds after traumatization caused no deaths among the wounded rats. A 60 μg/kg dose of sarin caused no deaths in intact rats but produced 50% mortality among the wounded rats which had lost 20% of their blood. Sarin given in 80μg/kg doses produced 11% mortality among the intact and 50% mortality in the traumatized rat group. Administration of 100, 120, and 140μ/kg of

sarin produced 50%, 82%, and 100% mortality among the intact, and 60%, 75%, and 100% mortality in the traumatized rat groups, respectively. Specific i.p. treatment with a mixture including 2 mg/kg atropine sulfate, 10 mg/kg benactizine hydrochloride, and 10 mg/kg pralidoxime was 100% successful in intact animals which had received s.c. 1, 2, 3, 4, or 5 LD50 of sarin and failed in only 50% of the traumatized animals which were given 5 LD50 of sarin, in each case 30-60 min prior to antidote treatment.

73-0972. Vojvodic, V.; Pantelic, D. (Inst. for Technol. and Med. Protect., Inst. of Exp. Med., Higher Acad. Med., Yugoslavia.) **Uticaj sarina na tok i ishod turnike-traume u kontrolnih i antidotima tretiranih zivotinja. [The action of sarin on the course and outcome of traumatic shock in control and antidote-treated animals.]** *Vojnosanit. Pregl. 29(3): 159-162; 1972.* (13 references) (Serbocroatian)

The interaction of traumatic shock and sarin-induced injury as well as that of combined injury and sarin antidote treatment was studied in Wistar rats. The physiopathology of the traumatic shock included hypovolemia, hyperpotassemia, hyponatremia, increased serum transaminase activities, metabolic acidosis, altered tissue catecholamine levels, and hypothermia. Acute toxicity studies of sarin administered s.c. to intact rats in doses ranging from 40 to 140 μg/kg indicated an LD50 of 110 ± 8.2 μg/kg. Combined mechanical trauma and chemical injury led to a syndrome of mutual deterioration causing death with sarin administered s.c. at 20 to 50 μg/kg. Treatment with a mixture including 2 mg/kg of atropine sulfate, 10 mg/kg of benactizine hydrochloride, and 10 mg/kg of pralidoxime i.p. forestalled death in all rats receiving one LD50 of sarin alone. Rats subjected to both traumatic shock and sarin treatment did not respond to this antidote application. The same antidote preparation caused 17% mortality among rats subjected to trauma alone.

73-0973. Mostafa, I. Y.; Bahig, M. R. E.; Fakhr, I. M. I.; Adam, Y. (Dept. of Radiobiol., Atomic Energy Authority and Nat. Res. Cent., Cairo, Egypt). **Metabolism of organophosphorus insecticides. XIV. Malathion breakdown by soil fungi.** *Z. Naturforsch. 27b (9): 1115-1116; 1972.* (15 references)

In an investigation of the degradation of ^{32}P-malathion by three soil fungi, *Penicillium notatum* had the highest activity, hydrolyzing 76% of the compound in 10 days. Over the same time period *Aspergillus niger* produced water soluble metabolites accounting for 59% of the dose and also a small amount of malaoxon. *Rhizoctonia solani* was completely inhibited at the level of malathion used. Even after the dose was reduced, only a small amount of degradation was observed. Very active carboxyesteratic hydrolysis as well as desmethylation was indicated in *P. notatum* and *A. niger*. Identified water soluble metabolites were thiophosphate, monomethyl phosphate, malathion diacid, malathion monoacid, dimethyl phosphate, dimethyl phosphorothioate, and dimethyl phosphorodithioate.

See also **73-0794** **73-0798** **73-0825** **73-0849** **73-0850** **73-0851** **73-0854** **73-0860**

73-0974. McKone, C. E.; Byast, T. H.; Hance, R. J. (Agr. Res. Council Weed Res. Org., Begbroke Hill, Yarnton, Oxford, OX5 1PF, England). **A comparison of some methods for the determination of triazine herbicides in water.** *Analyst (London) 97(1157): 653-656; 1972.* (10 references)

By using gas chromatography with an alkali flame detector, 0.001 ppm of atrazine, ametryne, and terbutryne in water from two sources could be determined with recoveries close to 100 per cent. Ultraviolet spectrophotometry was adequate at the 0.01 ppm level for all three compounds, but was unreliable at lower levels. With cathode-ray polarography, 0.005 ppm of terbutryne and ametryne and 0.01 ppm of atrazine could be determined. (Author abstract by permission)

73-0975. Bailey, S. (Pest Infestation Control Lab., Min. of Agr., Fisheries, and Food, Hook Rise South, Tolworth, Surrey, England). **Determination of alphachloralose. Part I. In stupefying bait.** *Analyst (London) 97(1157): 676-677; 1972.* (13 references)

Baits coated with α-chloralose are left in fields for several days to catch wood-pigeons; a method of determining the effective α-chloralose level in the baits is needed. The Hartman periodate oxidation method was modified by using industrial methylated spirit or absolute ethyl alcohol as the solvent for extraction of α-chloralose from the bait. Beta-chloralose, if present, will be included in the determination, but significant amounts of β-chloralose are not supposed to be present in the bait formulations. The bait is extracted for 16 hr with 74 O.P. industrial methylated spirit; then the periodate/10 *N* sulfuric acid reagent is added. After standing for 30 min, the solutions are treated with an excess of potassium iodide solution, and the iodine liberated is titrated with sodium thiosulfate, using a starch indicator. A blank value must be determined and subtracted. Recoveries are essentially complete at α-chloralose concentrations of 1% or more in bait.

73-0976. Baker, P. B.; Flaherty, B. (Dept. of Trade and Ind., Lab. of the Govt. Chemist, Cornwall House, London, England SE1 9NQ). **Fungicide residues. Part II. The simultaneous determination of residues of folpet, captan, and captafol in selected fruits by gas chromatography.** *Analyst (London) 97(1158): 713-718; 1972.* (15 references)

A simple method for the simultaneous detection, identification, and determination of folpet, captan, and captafol is presented. After extraction into acetonitrile, these fungicides are extracted into diethyl ether-hexane, subjected to column chromatography on silica gel, and quantitatively determined by electron-capture gas-liquid chromatography. A simple test for distinguishing between captan and folpet entails oxidation of the ether-hexane extract with acidic potassium permanganate, which destroys captan and captafol, but not folpet. Recoveries of 88-99% from fruit samples fortified at 0.05-10 ppm were achieved for captafol and folpet, but only 70-80% for captan. (Author abstract by permission, supplemented)

73-0977. Yuen, S. H.; Palmer, J. M. C. (Imperial Chem. Ind. Ltd., Agr. Div., Jealott's Hill Res. Sta., Bracknell, Berkshire, England). **Potentiometric determination of monuron in herbicide formulations.** *Analyst (London) 97(1160): 921-922; 1972.* (4 references)

Monuron is extracted from a dispersion of the sample in hydrochloric acid into chloroform, and the residue after evaporation of the chloroform is hydrolyzed with boiling 24 *N* sulfuric acid. The liberated dimethylamine is distilled into 2 per cent boric acid and titrated potentiometrically with standard hydrochloric acid. The method has been applied to technical monuron and aqueous suspension formulations with an error of 0.9 per cent. (Author abstract by permission)

73-0978. Mestres, R.; Campo, M.; Tourte, J. (Lab. de Chimie Appliquee a l'Expertise, Fac. de Pharm., Montpellier, France). **Residus de pesticides. XXIII. Recherche et dosage du thiabendazole dans les agrumes et les bananes. [Pesticide residues. Part 23. Detection and determination of thiabendazole in citrus fruits and bananas.]** *Ann. Fals. Exper. Chim. 65(703): 315-321; 1972.* (2 references) (French)

Maximum permissible thiabendazole residues of 3 mg/kg in whole fruit for bananas and 6 mg/kg for citrus have been established by the European Economic Community. However, penetration of thiabendazole into the interior of the fruit is minimal; the peel contains 88-94% of the total thiabendazole, depending on the variety of fruit. Analysis of the peel alone results in little loss of thiabendazole and greatly facilitates handling. Absence of pulp prevents the formation of hard-to-break emulsions, eliminates some interfering components, and improves the uniformity of the samples. In the recommended procedure, a sample of at least four fruits is peeled and the ratio of peel weight to total fruit weight calculated. The thiabendazole is extracted from a finely minced 7.5 g peel sample by blending with ammoniated ethyl acetate. The extract is dried with sodium sulfate and again blended, then filtered. After two washings with 1 *N* NaOH and then with water, the organic phase is extracted with 0.1 *N* HCl saturated with ethyl acetate. The acidic aqueous extract can be diluted for direct spectrophotometry or treated for various specific determinations. The optical density is measured by the baseline method between 260 and 334 nm with a maximum at 303 nm. The recovery is about 82% for bananas and citrus. The analytical method is identical to that used for determination of MBC, the active derivative of benzimidazole, except that the ultraviolet absorption maxima of the two fungicides differ.

73-0979. Veljanovski, A.; Milovancev, M. (Author address not given). **Prilog ispitivanju nekih organohlornih insekticida u poljskim uslovima. [A contribution to the field testing of certain organochlorine insecticides.]** *Arh. Farm. 21(4): 221-224; 1971.* (7 references) (Serbocroatian)

Colorimetric procedures for semiquantitative determination of DDT, aldrin, endrin, lindane, BHC, and toxaphene in contaminated flour under field conditions are presented. Flour samples (15 g) are extracted twice with 30 ml of petroleum ether; the filtered extract is concentrated to 5 ml and transferred to a 50-mm alumina (Brokman) adsorption column. The material is eluted with petroleum ether containing 3% ethyl ether; the eluate is concentrated on a steam bath and divided into three aliquot portions. DDT is determined in one aliquot by the WHO method, modified for field conditions in that potassium or ammonium nitrate is used for the nitration instead of fuming nitric acid; ethanolic KOH is replaced by methanolic KOH, and a light blue color develops in the presence of DDT. All solvents are evaporated on a steam bath rather than in a warm air stream. Endrin and dieldrin are determined in the second aliquot by the method of Lidov et al., modified by the addition of ethanolic rather than methanolic NaOH to the residue after evaporation. The resulting solution is then treated with about 30 mg sulfur, heated under an ascendant air condenser for 15 min, and cooled to room temperature. Development of a reddish or orange-red color in 10-30 min indicates the presence of endrin or dieldrin. The third aliquot is examined for lindane, BHC, and toxaphene by treatment with alkaline pyridine. A lemon yellow color develops in the presence of lindane or BHC isomers and a violet color in the presence of toxaphene. Limits of detection are in the 1 mg range except for DDT, which is detectable at 6 μg.

73-0980. Ueji, M.; Kanazawa, J. (Min. of Agr. and Forestry, Nat. Inst. of Agr. Sci., Tokyo, Japan). **[Method for the determination of carbamate insecticide residues** *Bunseki Kagaku (Jap. Anal.) 22(1): 16-20; 1973.* (9 references) (Japanese)

A method was developed for determining traces of *N*-methylcarbamate insecticides in crops by reacting the carbamates with trifluoroacetic anhydride and detecting the *N*-trifluoroacetic acid (*N*-TFA) derivatives by gas chromatography with ECD. In a modification of the method of Lau et al. (*J. Agr. Food Chem.* 18: 413; 1970), optimal conditions comprised reaction for 3 hours at 50 C for eight substituted phenyl and naphthyl *N*-methylcarbamates: 3-methylphenyl, 2-chlorophenyl, 3,5-dimethylphenyl, 2-*sec*-butylphenyl, 3,4-dimethylphenyl, 3-*tert*-butylphenyl, 2-isopropoxyphenyl (propoxur), and 1-naphthyl *N*-methylcarbamate (carbaryl). The relative retention times of the stable *N*-TFA derivatives did not differ on five column packings and increased in the order listed above. The column packings tested were 5% OV-17, 5% OV-25, 2% PEGA, 2% XE-60, and 2% QF-1 plus 6% OV-17; the first two gave optimal resolution. To detect 3-methylphenyl *N*-methylcarbamate, 10 g of powdered unpolished rice or 5 g chopped rice straw was Soxhlet-extracted with 100 ml of dichloromethane for 6 hr. The extract was partitioned between acetonitrile and *n*-hexane, and the acetonitrile phase was diluted with 4% aqueous NaCl and extracted with dichloromethane. The extract was passed over a Florisil column and eluted with dichloromethane saturated with water, then the eluate cleaned up by passing over a column packed with activated alumina and eluted with 10% acetone in *n*-hexane. The solvent was evaporated and the residue dissolved in ethyl acetate, trifluoroacetylated under the conditions mentioned above, then injected into the gas chromatograph. Recovery of 91-98% was attained from specimens containing residues at 0.1-0.4 ppm.

73-0981. Blum, W.; Mueller, S.; Hrosch, W. (Ciba-Geigy AG, Basel, Switzerland). **Die Kombination eines Gaschromatographen mit einem Massenspektrometer-Problematik und Anwendung der Methode. [Combination of a gas chromatograph with a mass spectrometer-problems and uses of the method.]** *CZ Chem. Tech. 1(8): 385-392; 1972.* (46 references) (German)

Problems of the combination of a gas chromatograph with a mass spectrometer and uses of this combined analytical procedure are reviewed. It is possible to isolate the different PCB (polychlorinated biphenyl) isomers by gas chromatography using a nonpolar thin-film capillary, 20 m long. The use of mass fragmentography permits the separation of DDT isomers from PCB mixtures on packed separation columns despite the fact that the column performance is not adequate for a complete gas-chromatographic separation. Subsequently, differences in the fragmentation are utilized for distinguishing the compounds.

73-0982. Goeke, G. (Chemisches Untersuchungsamt der Stadt Hagen, Hagen, Germany). **Gas-Chromatographie und Umweltschutz. Beitrag zur gas-chromatographischen Untersuchung von Wasser. [Gas chromatography in environmental protection. A contribution to gas chromatographic investigation of water.]** *FetteSeifen Anstrichm. 74(3): 168-172; 1972.* (8 references) (German)

Gas chromatographic techniques for the determination of contaminants such as pesticide residues in water are described. Water samples to be analyzed for organochlorine and organophosphorus pesticide residues are extracted with dichloromethane, dried with sodium sulfate, and the solvent evaporated. The dry residue is dissolved in benzene. If necessary, further cleanup can be performed on a Florisil or silica gel/activated carbon column. A column temperature of 185°C, an injection

temperature of 200°C, and a detector temperature of 230°C are used with hydrogen as the carrier gas at a flow rate of 30 ml/min. Dow-11 is a suitable adsorbent for the determination of lindane, aldrin, heptachlor, endosulfan, dieldrin, Perthane, DDD (TDE), DDT, and methoxychlor on a gas chromatograph with a flame ionization detector while organophosphorus pesticides may require a phosphorus-specific alkali flame ionization detector. The determination of acid herbicides in water in the presence of phenols and insecticides requires preliminary separation by extraction with petroleum ether plus dichloromethane, from which two phases, one containing acids and phenols, and another the other pesticides, are obtained. The herbicides are methylated for determination, and the residue after evaporation is dissolved in benzene. A column temperature of 175°C, a detector (ECD or FID) temperature of 220°C, and an injection temperature of 190°C are the basic instrument parameters.

73-0983. Martynyuk, N. V.; Mynka, A. F. (L'vov Med. Inst., L'vov, USSR). **Opredeleniye trikhloratsetata natriya (TKhA) v obyektakh vneshney sredy i biosubstratakh. [Determination of sodium trichloracetate (TCA) in environmental objects and biological substrates.]** *Gig. Sanit. 37 (10): 65-66; 1972.* (Russian)

A colorimetric method for the quantitative determination of sodium trichloroacetate (TCA) residues in soil and plant samples as well as in biological substrates is described. The aqueous extracts obtained from soil, plant, and substrate samples are treated with potassium hydroxide and soda after which pyridine is added. The clear pink solution obtained after centrifugation is analyzed colorimetrically by comparing the optical density with a calibration curve. The method has a precision of 2-4% at a sensitivity of 0.0001 mg/ml.

73-0984. Vioque, A.; Albi, T. (Inst. de la Grasa y sus Derivados, Departamento de Analisis, Seville, Spain). **Residuos de pesticidas en grasas comestibles. I. Analisis de insecticidas clorados. [Pesticide residues occurring in edible fats. I. Analysis of chlorinated insecticides.]** *Grasas Aceites 23(3): 213-223; 1972.* (7 references) (Spanish)

A method for the determination of organochlorines in edible fats is presented. Extraction and purification include treatment of an oil sample with a 4-fold amount of hexane, extraction of this mixture with *N,N'*-dimethylformamide (DMF) containing 8% water, and transfer of the DMF layer into an extraction funnel containing an 8-fold amount of a 2% aqueous solution of sodium sulfate. Extraction with DMF is performed three times; the extracts are then collected and reextracted with hexane. The hexane extract (washed with sodium sulfate solution) is then reduced to a small volume (rotary evaporator at 35°C), chromatographed on an activated aluminum oxide column (provided with an anhydrous sodium sulfate layer on top), and eluted with hexane. Hexane eluate is then subjected to gas chromatography. Argon with 5% methane at a 70 ml/min flow rate as a carrier gas, 185°C column and detector, and 215°C injection temperatures provide good resolution for organochlorine mixtures including BHC, lindane, heptachlor, aldrin, heptachlor epoxide, *p,p'*-DDE, dieldrin, endrin, *o,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-DDT. A column packed with silicone XE-60 over Chromosorb and operating at 210°C can be used for the confirmation of analytical data. Thin-layer chromatography on aluminum oxide G is recommended as an auxiliary technique. The alumina layer, including the chromogenic reagent (silver nitrate and rancid oil as a peroxide source), is kept in the dark prior to sample application, then developed with *n*-heptane, air-dried for 10-20 min, and exposed to UV light. Brown-black spots indicate the presence of organochlorines. Partial conversion of *p,p'*-DDT into *p,p'*-DDD occurs during this procedure.

73-0985. Vitorovic, S.; Kapor, S.; Neskovic, N. (INEP Pesticide Manufacturing Plant, Zemun, Yugoslavia). **Odredivanje nekih organofosfornih insekticida u zivotinjskim tkivima metodom gasne hromatografije. [Determination of some organophosphate insecticides in animal tissues by means of gas chromatography.]** *Hrana Ishrana 12(9-10): 417-421; 1971.* (10 references) (Serbocroatian)

A procedure was developed for the determination of parathion and paraoxon in animal tissues by means of gas chromatography. Known amounts of these compounds were added to rat liver and muscle tissue in vitro and homogenates with acetonitrile prepared 3 to 5 minutes later. The acetonitrile extract, filtered through anhydrous sodium sulfate, was evaporated to dryness (vacuum) and redissolved in acetonitrile, then cleaned up by thin-layer chromatography. Chromatoplates (silicagel G 0.25 mm thick) were first activated at 105°C for 30 min, and samples were left to travel a 14 cm path in an acetone/chloroform (1/1) system, then visualized with an alcoholic sodium hydroxide solution by heating at 105°C for 15 min. Paraoxon and parathion had 0.74 and 0.87 *Rf* under these conditions. The spots were then scratched off and the insecticides extracted with acetone for gas chromatography on a varian 2100-20 instrument provided with a phosphorus detector. A 1.5 m long (6mm diam.) column packed with two stationary phases (DC-200 and QF-1 silicone oil) and chromosorb W as a support at 180°C, the detector at the same temperature, and the injection port at 200°C provided optimum operating conditions with nitrogen as a carrier gas flowing at 30 ml/min. Linearity of the detector was maintained for 10-30 ng parathion and 3 to 80 ng paraoxon under the above conditions. The whole procedure including homogenization and gas chromotography takes 3 to 4 hours providing 70 to 90% recovery of the added insecticides.

73-0986. Matveyeva, S. A. (Inst. Chem. Phys., Acad. Sci. USSR, Moscow, USSR). **Opredeleniye 2,4′-DDD, yego proizvodnykh i tekhnologicheskikh primesey v lekarstvennykh formakh preparata i biologicheskom materiale metodom gazo-zhidkostnoy khromatografii. [Determination of 2,4′-DDD, its derivatives and technological admixtures in medicinal preparation forms and biological materials by means of gas-liquid chromatography.]** *Izv. Akad. Nauk SSSR Ser. Biol. 5: 742-746; 1972.* (5 references) (Russian)

Gas-liquid chromatographic method for the qualitative and quantitative determination of 2,4′-DDD (TDE) and its metabolites in drug preparations and in biological materials are described as are studies of 2,4′-DDD metabolites in blood and urine of 2,4′-DDD-treated patients. The isolation of 2,4′-DDD is done by continuous extraction with diethyl ether at 60°C for 1 hr; the dry residue obtained is dissolved in *n*-hexane for chromatographic determination in FID-equipped chromatograph at a column temperature of 220 C. The 2,4′-DDD isomers identified and determined in blood sampled from 2,4′-DDT-treated patients were 1,1-dihydro-2,2-bis-(2,4′-dichlorodiphenyl)-ethylene, 1,1-hydrochloro-2,2-bis-(2,4′-dichlorodiphenyl)-ethylene, and 2,2-bis(2,4′-dichlorodiphenyl)-1-chloroethane. The 2,4′-DDD residues in blood persisted up to three months after the cessation of the treatment. Urine samples contained mostly 2,4′-dichlorodiphenyl acetic acid.

73-0987. Hannan, E. J.; Bills, D. D.; Herring, J. L. (Dept. of Food Sci. and Technol., Oregon State Univ., Corvallis, OR 97331). **Analysis of polychlorinated biphenyls by gas chromatography and ultraviolet irradiation.** *J. Agr. Food Chem. 21(1): 87-90; 1973.* (13 references)

An ultraviolet irradiation method developed to aid in the identification of chlorinated insecticides was applied to a commercial mixture of polychlorinated biphenyls (PCBs) (Aroclor 1254). Following gas chromatographic separation, each PCB peak was trapped, irradiated, and rechromatographed. In most cases the degradation pattern of the PCB peak differed from the degradation pattern of the insecticide having the same retention time. Only heptachlor epoxide, *p,p′*-DDD(TDE), and *o,p′*-DDT failed to give degradation peaks which could be distinguished from PCBs. A mixture of the chlorinated insecticides and PCBs was trapped, irradiated, and rechromatographed to note any interferences or changes which might occur when both are present together. When samples of herring and salmon oil containing both PCBs and insecticides were analyzed by this method, the peaks that apparently contained only PCBs yielded degradation patterns with the same peak area ratios as the standard. The ratios were changed in the presence of insecticides or other compounds. (Author abstract reprinted by permission of the American Chemical Society and supplemented)

73-0988. Plimmer, J. R.; Ruth, J. M.; Woolson, E. A. (Agr. Environ. Qual. Inst., Agr. Res. Serv., U. S. Dept. of Agr., Beltsville, MD 20705). **Mass spectrometric identification of the hepta- and octa- chlorinated dibenzo-*p*-dioxins and dibenzofurans in technical pentachlorophenol.** *J. Agr. Food Chem. 21(1): 90-93; 1973.* (11 references)

Analytical measurements indicate that technical pentachlorophenol, a widely used pesticide, contained chlorinated dibenzo-*p*-dioxins. High-resolution mass spectrometry was used to determine the elemental composition of ions present in the spectrum of the mixture obtained as a cleaned-up neutral fraction from technical pentachlorophenol. Hepta- and octachlorodibenzo-*p*-dioxins were identified in the sample, as were hepta- and octachlorodibenzofurans. (Author abstract reprinted by permission of the American Chemical Society)

73-0989. Purkayastha, R.; Cochrane, W. P. (Chem. and Biol. Res. Inst., Res. Branch, Canada Dept. of Agr., Ottawa, Ontario K1A OC6, Canada). **Comparison of electron capture and electrolytic conductivity detectors for the residue analysis of *s*-triazine herbicides.** *J. Agr. Food Chem. 21(1): 93-98; 1973.* (10 references)

The capabilities of ^{63}Ni electron capture (ECD) and electrolytic conductivity detectors (CCD) have been compared for the analysis of *s*-triazine herbicides in water, soil, and corn samples by gas chromatography. Atrazine was selected for the residue study and other *s*-triazines were studied using various stationary phases only for their gas chromatographic characteristics. Quantitative recovery of atrazine from fortified water samples was obtained using dichloromethane. Extraction by acetonitrile, methanol, and acetone showed good recovery for soil samples. Acetonitrile extraction was found adequate for corn analysis. The cleanup procedures involved partitioning and column chromatography on deactivated alumina. Comparable sensitivities were obtained using both methods of detection and quantitation for the range studied (0.02 to 2.0 ppm). The CCD seemed to have wider application than the ECD, which required cleanup in all cases studied. The conductivity analysis of water and soil samples could be performed quantitatively without cleanup, whereas corn samples required cleanup. (Author abstract reprinted by permission of the American Chemical Society)

73-0990. Devine, J. M. (Lake Ontario Environ. Lab., State Univ. College, Oswego, NY 13126). **Determination of D-048 [1-(2-butynyl)-1-(*p-tert*-butylphenoxy)-2-butyl sulfite] in cottonseed.** *J. Agr. Food Chem. 21(1): 98-99; 1973.* (2 references)

A gas chromatographic method is described for the determination of D-048 [1-(2-butynyl)-1-(*p-tert*-butylphenoxyl)-2-butyl sulfite] residues in cottonseed, cottonseed meal, and cottonseed oil. After extraction and

cleanup by acetonitrile partition and Florisil column chromatography, D-048 is identified using a flame photometric detector in the sulfur mode. Recovery of D-048 averaged 91 ± 9% from the various cottonseed samples fortified at levels ranging from 0.1 to 1.0 ppm. The method is sensitive to 0.2 ppm for cottonseed oil and 0.1 ppm for cottonseed and cottonseed meal. (Author abstract reprinted by permission of the American Chemical Society)

73-0991. Van Middelem, C. H.; Peplow, A. J. (Pestic. Res. Lab., Food Sci. Dept., Univ. of Florida, Gainesville, FL 32601). **Evaluation of extraction procedures for the removal of ^{14}C-carbofuran and its toxic metabolites from cabbage leaves.** *J. Agr. Food Chem. 21(1): 100-103; 1973.* (7 references)

The soil of potted cabbage plants was treated with carbonyl-^{14}C-carbofuran and leaves were sampled 7, 14, 35, and 56 days after treatment. Cabbage leaves sampled 35 days after treatment were subjected to five extraction procedures to determine their relative efficiency for the removal of ^{14}C-carbofuran and its toxicologically significant metabolites. Three of these procedures (acid digestion, two successive 5-min blendings with methanol and 24-hr Soxhlet extraction using methanol) were found to be approximately 90% efficient. The least effective extraction procedure was two 5-min blendings with ethyl acetate. Thin-layer chromatographic-cholinesterase inhibition of the five extractions indicated that 85-90% of the ^{14}C in extract of leaves sampled 35 days after treatment was associated with 3-hydroxycarbofuran. The extraction of ^{14}C from cabbage leaves appeared less efficient as the posttreatment sampling period increased from 7 to 56 days. For all sampling dates at least 80% of the ^{14}C appeared to be associated with 3-hydroxycarbofuran. (Author abstract reprinted by permission of the American Chemical Society)

73-0992. Barrette, J. P.; Scheuneman, E.* (Analytical Methodology Lab., Analytical Serv. Sect., Dept. of Agr., Ottawa, Ontario, K1A OC5, Canada). **Analysis of amitrole-simazine formulations.** *J. Agr. Food Chem. 21(1): 142-143; 1973.* (5 references)

A simple method was developed for analysis of amitrole-simazine formulations. The 2-chloro-4,6-bis(ethylamino)-*s*-triazine (simazine) is quantitated by gas chromatography, and the 3-amino-1,2,4-triazole (amitrole) is quantitated by measuring the absorbance of the amitrole-nitroprusside complex at 632 nm according to the method of Sund (1956). (Author abstract reprinted by permission of the American Chemical Society)

73-0993. Di Muccio, A.; Boniforti, L.; Monacelli, R. (Lab. Chim., Ist. Sup. Sanit., Rome, Italy). **Gas chromatographic separation of hexachlorobenzene and the α-, β-, γ- and δ-isomers of hexachlorocyclohexane.** *J. Chromatogr. 71(2): 340-346; 1972.* (12 references)

Experiments were conducted to find a packing which would separate hexachlorobenzene (HCB) and the four principal isomers of BHC and preferably permit separation of these compounds from other organochlorine pesticides as well. The inability of conventional packings to separate HCB from α-BHC probably accounts for the high α-BHC contents reported for milk and cheese samples. Identical chromatographic conditions were used for all columns tested. The columns were a coiled glass column, 2.40 m X 4 mm i.d., packed with 5% by weight of OV-1 on 80-100 mesh silanized Gas-Chrom P; a similar column packed with 5% by weight of OV-61 on a similar support; and a coiled glass column, 2.30 m X 3 mm i.d., packed with 3% by weight of XE-60 on 80-100 mesh silanized Anakrom AS. Since varying separations were attained with each column, mixtures of the phases were tested. Optimal separation of HCB and BHC isomers was attained with a coiled glass column, 2 m X 3 mm i.d., packed with a 1 + 1 + 0.5 mixture by weight of three pre-coated packings: 3% OV-61 on 80-100 mesh silanized Gas-Chrom P, 7.5% by weight of QF-1 on 80-100 mesh Chromosorb W HP, and 3% XE-60 on 80-100 mesh silanized Anakrom AS. Good separation of isomers is attained in a few minutes on this column.

73-0994. Palmer, L.; Kolmodin-Hedman, B. (Dept. of Toxicol., Swedish Med. Res. Council, Karolinska Inst., S-104 01, Stockholm 60, Sweden). **Improved quantitative gas chromatographic method for the analysis of small amounts of chlorinated hydrocarbon pesticides in human plasma.** *J. Chromatogr. 74(1): 21-30; 1972.* (26 references)

A sensitive, reliable method suitable for multiple analyses of chlorinated pesticides in human plasma has been developed. Standard curves for GC elution of lindane, *p,p'*-DDE, *o,p'*-DDT, and *p,p'*-DDT were prepared, using heptachlor epoxide as an internal standard. Plasma containing known amounts of organochlorines plus internal standard was extracted with hexane in the presence of formic acid and anhydrous sodium sulfate; the extract was washed with potassium carbonate solution. The extract was analyzed on a Varian GC equipped with a tritium foil electron capture detector. Mass fragmentography, using a combined GC-MS equipped with a multiple ion detector and a PDP 12 computer, verified the peaks obtained. No polychlorinated biphenyls interfered with the peaks of organochlorines analyzed. The method can detect small variations in a given individual with changes in extent of exposure to pesticides.

73-0995. Miller, J. C.; Sink, J. D.; Sherritt, G. W.; Ziegler, J. H. (Dept. of Anim. Sci., Penna. State Univ., Uni-

versity Park, PA 16802). **Studies of a method for determining organochlorine pesticide residues in animal tissue.** *J. Food Sci. 36(6): 880-882; 1971.* (19 references)

The modified Mills procedure for determination of organochlorine residues in animal tissue yielded significantly different results in five laboratories. All laboratories used electron capture GC in the determining step although the instruments were not identical. Only two of the laboratories would have recommended condemnation of the steer sampled with an adipose tissue level of 8.13 ppm, greater than the allowable 5 ppm. Scrotal tissue samples varied little; internal adipose tissue samples commonly used as criteria for condemnation varied greatly (72.3% average deviation from mean). No statistically significant differences were observed in a repeatability study in a single laboratory for individual residues. The error percent associated with each determination ranged from 2.5% for DDT to 12.5% for DDE, but was generally under 10%. The efficiency of the heat extraction step differed significantly among seven laboratories in a second repeatability study; those laboratories which had difficulties with this step did not always have difficulty with the analytical step.

73-0996. Markina, V. V. (All-Union Sci. Res. Inst. Disinf. Steril., Moscow, USSR). **Opredeleniye isparyayemosti, vsasyvayemosti i vydeleniya repellentov iz organizma cheloveka. [Determination of the evaporation, absorption, and elimination of repellents in the human organism.]** *Lab. Delo 8: 493-494; 1971.* (Russian)

A thin-layer chromatographic method is described for the simultaneous determination of diethyl toluamide, benzimine, and carboxide residues on human skin surface and in blood and urine samples 30 min to 3 days following application. The method permits the determination of the evaporation, absorption, and elimination rates and the minimum effective dose of repellents for insects. Chloroform, benzene, toluene, hexane, or heptane was used as the background solvent and ethyl acetate, methanol, or ethanol as eluent. After the samples were treated with acetone, 0.001-0.03 ml of the sample was placed on the starting line. Ultraviolet light was used for blood and urine samples. Quantitative determination was done against standard solutions.

73-0997. Stijve, T. (Control Lab. of Nestle Products Tech. Assistance Co., Ltd., 1814 La Tour-de-Peilz, Switzerland). **The determination and occurrence of hexachlorobenzene residues.** *Mitt. Geb. Lebensmittelunters. Hyg. 62(4): 406-414; 1971.* (18 references)

Analytical methods for the determination of hexachlorobenzene in cereals, fats, and dairy products have been improved. Fatty foods were easily analyzed using a one-step direct elution method. Pentane-methylene chloride eluate from a Florisil column was used for GC and TLC analysis. An exhaustive extraction with pentane or hexane with an alumina clean-up was necessary in the case of non-fatty foods. Alternatively, prolonged steam distillation with constant extraction of the distillate in benzene was used for non-fatty foods. GC analysis using a mixed liquid phase column (OV-17/QF-1) was satisfactory for hexachlorobenzene as well as DDT analogs and the cyclodiene pesticides. Hexachlorobenzene was found in 28% of a variety of raw materials from various parts of the world. Levels > 0.1 ppm were found in cereals, milk, beef fat, and chicken fat. Some evidence of partial degradation of hexachlorobenzene was found during analysis of chicken fat samples.

73-0998. Beynon, K. I. (Woodstock Agr. Res. Cent., Shell Res. Ltd., Sittingbourne, Kent, England). **The analysis of crops and soils for the triazine herbicide cyanazine and some of its degradation products. I. Development of method.** *Pestic. Sci. 3(4): 389-400; 1972.* (4 references)

Radiochemical techniques have been used to develop efficient procedures for the extraction of residues of cyanazine herbicide [BLADEX, FORTROL, 2-chloro-4-(1-cyano-1-methylethylamino)-6- ethylamino-1,3,5-triazine] and its metabolites 2-chloro-4-(1-carbamoyl-1- methylethylamino)-6-ethylamino-1,3,5-triazine, 2-chloro-4-(1-cyano-1- methylethylamino)-6-amino-1,3,5-triazine, and 2-chloro-4-(1-carbamoyl-1-methylethylamino)-6-amino-1,3,5-triazine from crops and soils. Partition and column chromatographic techniques have been established for the purification of the extracts. The full analytical procedure is described and the final determination of all four compounds is by GLC with electron capture detection, with blank values for field samples generally 0.02 part/million and with good recoveries. (Author abstract by permission)

73-0999. Mendoza, C. E. (Health Protect. Branch, Dept. of Nat. Health and Welfare, Ottawa, KIA OL2, Ontario, Canada). **Analysis of pesticides by the thin-layer chromatographic-enzyme inhibition technique.** *Residue Rev. 43: 105-142; 1972.* (81 references)

The TLC-EI technique is rapidly gaining an important role in pesticide residue analysis. It has been developed for determination of a number of organophosphorus, carbamate, and organochlorine pesticides and also some alkaloids. Selectivity, sensitivity, and versatility in detecting enzyme inhibitors are some of its remarkable features. The technique can be used for simultaneous screening of pesticide residues, which otherwise cannot be adequately analyzed by GLC or other methods. It can be used to confirm or verify results obtained by GLC, colorimetry, or bioassay methods. It is also an important tool in the study of metabolic pathways of enzyme inhibitors. The discussion includes a short review of the development of the method, principles of the technique, a comparative

methodology of detection of pesticide residues and metabolites, detection limits, and merits and limitations of the technique. A general preparation of enzyme and substrate solutions is included to give the future users of the technique a starting point. Details of the technique may be obtained from the original articles. (Author abstract by permission)

73-1000. Midio, A. F. (Fundacao de Amparo a Pesquisa, Disciplina de Toxicol. Depto. Anal. Clin. e Toxicol., Fac. Ciencias Farm., Univ. Sao. Paulo, Sao Paulo, Brazil.) **Rodamina-B como agente cromogenico na cromatografia em camada delgada de insecticidas clorados. [Rhodamine B, a chromogenic reagent in chlorinated insecticide thin-layer chromatography.]** *Rev. Farm. Bioquim. Sao Paulo 9(1): 225-234; 1971.* (17 references) (Portuguese)

Optimum conditions are presented for semiquantitative determination of DDT, γBHC (lindane), heptachlor, γ-and α-chlordane, aldrin, dieldrin, and endrin by thin-layer chromatography using rhodamine B as a chromogenic reagent. Optimal resolution and reproducibility are attained on 20 X 20 cm glass plates, coated with Alumina G (30 alumina in 50 ml dist. water, 250 mμ thickness), air-dried at room temperature, activated at 110°C (for 2 hr), and reactivated (for 1/2 hr) prior to sample spotting. A 10 cm travel path is attained within 25 min using *n*-hexane as developing solvent. Visualization is achieved by spraying with a 0.25% solution of rhodamine B in ethanol. Pink spots on a pale pink background indicate the presence of the respective organochlorines in amounts as low as 0.5 μg. Under these conditions, the *Rf* values of α-chlordane, γ-chlordane, endrin, DDT, aldrin, dieldrin, heptachlor, and lindane are 70, 76, 48, 88, 95, 35, 93, and 65, respectively.

73-1001. Lara, W. H. (Secao de Aditivos e Pesticidas Residuais, Inst. Adolfo Lutz, Sao Paulo, Brazil). **Determinacao de residuos de pesticidas organoclorados em alimentos. [Determination of organochlorine pesticide residues in foods.]** *Rev. Inst. Adolfo Lutz 31: 127-132; 1971.* (9 references) (Portuguese)

The principles involved in the analysis of organochlorine residues in foods are outlined. Included are definitions, sampling, extraction, and purification procedures as well as detection and identification measures. Extraction procedures are broken down according to the material to be analyzed (fruits and vegetables, high sugar-containing fruits, and high fat content foods). The solvents applied for the extraction of organochlorines are discussed with special reference to acetonitrile, ethyl ether, and petroleum ether. Florisil (60/100 mesh, activated at 650°C) columns are recommended for extract purification. Elution with petroleum ether solutions containing 6% ethyl ether is recommended for samples containing aldrin, BHC, DDE, *o,p'*- and *p,p'*-DDT, heptachlor, heptachlor epoxide, lindane, and methoxychlor. A second elution of the Florisil column with petroleum ether containing 15% ethyl ether is recommended for dieldrin and endrin containing samples. Three-to-5 μl aliquots should be used for gas chromatography. Operating conditions for columns using stationary phases with 2.5% DC-200 and 2.5% QF-1 include column temperature of 190°C, injector and detector temperatures of 200°C, and nitrogen as a carrier gas at a 30 ml/min flow rate.

73-1002. Boniforti, L.; Camoni, I. (Ist. Super. Sanit., Lab. Chim., Rome, Italy). **La determinazione dei residui de pesticidi organophosphorati negli alimenti. [Determination of organophosphate pesticide residues in foods by means of gas chromatography.]** *Sci. Aliment. 18(1): 13-19; 1972.* (26 references) (Italian)

Three types of flame ionization detectors to be used alone or combined with electron capture detectors in gas chromatography of organophosphate pesticide residues are described. Attention is focused on the conditions providing for constant flame ionization. A mixture of cesium bromide and potassium bromide on chromosorb placed above the flame provides a source of alkali metal ions in one type of detector; daily adjustment of the hydrogen flow (flame fuel) is required to control the ionization levels. A cylindrical potassium chloride crystal placed along the vertical axis of the platinum electrode provides the ion source for the second type of detector; the distance between the crystal and the edge of the flame is easily adjustable, allowing for continuous control of the optimal flame ionization conditions. The inconvenience of excessive sensitivity to slight fluctuations in the hydrogen flow is solved by the differential detector described by Riva and Carisano in 1969. The detector features two flames fueled by a single hydrogen stream merged with the carrier gas from the gas chromatographic column. The differential detector provides for easier control of the ionization conditions and better reproducibility of analytical data. A review of confirmatory tests and a discussion on the breakdown of the organophosphates in the environment using parathion as an example are included.

73-1003. Vergeychik, T. Kh.; Linnikova, V. A. (Dept. Toxicol. Chem., Pyatigorsk Pharmaceut. Inst., Pyatigorsk, USSR). **Opredeleniye natriyevoy soli 2-metil-4-fenoksiuksusnoy kisloty v pecheni trupa. [Determination of sodium-2-methyl-4-chlorophenoxyacetate in cadaveric liver.]** *Sud. Med. Ekspertiza 15: 40-43; 1972. (Russian)*

Methods for the isolation and qualitative and quantitative determination of sodium-2-methyl-4-chlorophenoxyacetate in cadaveric substrates such as liver are recommended. After the sample is treated with sodium chloride, threefold extraction with water is done for 6 hr. The aqueous extract, treated with sodium hydroxide

and zinc sulfate solutions, is filtered and adjusted to pH 1-2 with sulfuric acid and further extracted with chloroform three times with a solvent-water ratio of 1:8. Following filtration and distillation, the residue is combined with chloroform; the sample obtained is halved for qualitative and quantitative determinations. Identification is possible by means of paper chromatography, thin-layer chromatography, paper electrophoresis, and ultraviolet spectrophotometry. Quantitative determination by ultraviolet spectrophotometry against a calibration chart requires further purification by means of paper electrophoresis.

73-1004. Bokina, A. I.; Pushkina, N. N.; Osintseva, V. P.; Dmitriyev, M. T. (Author address not given). **Obzor sovremennykh metodicheskikh podkhodov pri gigiyenicheskikh issledovaniyakh. [A review of current methodological approaches in hygienic research.]** *Vestn. Akad. Med. Nauk SSSR 27(1): 65-70; 1972.* (Russian)

Physiological, biochemical, pathomorphological, physicochemical, and radiological methods employed in hygienic studies of the effects of various environmental factors on human health are surveyed. Studies of metabolic and enzymatic activity are applied to the hygienic assessment of the effects of organophosphorus pesticides. The embryotoxic effects of certain substances can be studied by autoradiographic examination of blood-brain and placental barriers. Residue analysis is possible by such highly sensitive methods as chromatography, mass spectrometry, spectrophotometry, colorimetry, luminescence analysis, polarography, and radiometry.

73-1005. Polyakova, V. N. (All-Union Inst. Exp. Vet. Med., Moscow, USSR). **Opredeleniye DDT i gamma-izomera GKhTsG khromatografiyey v tonkom sloye. [Thin-layer chromatographic method for the determination of DDT and gamma-BHC.]** *Veterinariya (Moscow) 49(6): 96-97; 1972.* (Russian)

A thin-layer chromatographic method for the determination of DDT, its *o,p'* - and *p,p'*-isomers, and of gamma-BHC (lindane) in organs, plant parts, and other materials is described. After extraction with *n*-hexane and adsorption, the sample is chromatographed on a silica-gel layer using *o*-tolidine as chromogenic reagent and *n*-hexane as the mobile phase. The lower limit of detectability is 0.2 μg in the sample or at 0.04 mg/kg with an accuracy of 85%.

73-1006. Veljanovski, A.; Milovancev, M. (Hygiene and Epidemiology Inst., Skopje, Yugoslavia). **Dokazivanje i odredivanje organotiofosfornih insekticida u brasnu tankoslojnovu hromatografijom u poljskim uslovima. [Detection and determination of organothiophosphate insecticides in flour by means of thin-layer chromatography under field conditions.]** *Vojnosanit. Pregl. 29(6): 271-273; 1971.* (5 references) (Serbocroatian)

A procedure is presented for the detection and semi-quantitative determination of organophosphates in flour samples under field testing conditions. Extraction of 5 g flour samples is performed with chloroform directly after addition of 0.5 g of activated charcoal and 3 g of aluminum oxide, or after preliminary threefold extraction with ethyl ether. The chloroform extract is applied (after filtration) on a silica-gel G layer in 5 to 50 μl. amounts, developed with a benzene/ether/acetone (6/2/1) system, and visualized with a chromogenic reagent consisting of 0.5 g palladium chloride, 2 ml concentrated HCl, and water to make 100 ml of solution. Development of light yellow, yellow, or dark spots indicates the presence of organophosphates which can be identified by comparison with known compound *Rf* values. The amount of insecticide can be approximated from the color intensity and size of the spot. The procedure is applicable for parathion, diazinon, thiometon, dimethoate, methiocarb, methyl parathion, azinphos-methyl, malathion, and bromophos with lower detection limits ranging from 0.3 μg (carbophenothion, thiometon) to 0.6 μg (diazinon) per flour sample. Indirect chloroform extraction is preferable only in the case of azinphosmethyl; better extraction yields are achieved by direct extraction with chloroform in all the other cases. Organochlorines such as lindane, DDT, aldrin, endrin, and dieldrin can be detected likewise using a diphenylamine reagent as a chromogen; formation of green spots indicates the presence of organochlorines.

73-1007. Soerensen, O. (Hygiene-Institut des Ruhrgebietes, Gelsenkirchen, Germany). **Kolorimetrisch bestimmbare Herbizide: Analyse, Abbau, Toxikologie. [Herbicides detectable by colorimetry: analysis, degradation, toxicology.]** *Vom Wasser 38: 17-26; 1971.* (24 references) (German)

Ion exchange techniques can be used effectively for the concentration of herbicides from large water samples when followed by specific, sensitive colorimetric measuring methods. A free ion exchange capacity is not required for chlorate, paraquat, and diquat. A detailed procedure must be followed using cation exchange resins for amitrole to ensure that the blank values will be small enough, the azo coupling uniform, and the recoveries reproducible. Only about 50% recovery is attained after elution from the exchanger. Quantitative recovery of paraquat is achieved by saturating the cation exchange resin with *N*-methylpyridinium- methylsulfate before use. This substance can also be used as a solvent for the extraction of paraquat from soil samples. Biological degradation in soil was demonstrated for chlorate, amitrole, and diquat, but not for paraquat. Current literature regarding the chronic toxicity of these herbicides is reviewed.

73-1008. Bauer, U. (Inst. fuer Wasserforsch. GmbH, Dortmund, Germany). **Kombination von Duennschicht-**

und Gaschromatographie zur Identifizierung von Halogenkohlenwasserstoffen. [Combination of thin-layer and gas chromatography for identification of halogenated hydrocarbons.] *Vom Wasser 38: 49-62; 1971.* (68 references) (German)

A combined thin-layer chromatographic/gas chromatographic method is described for determination of PCBs and organochlorine pesticides in extracts from water or sediment. Preliminary separation is achieved by ascending thin-layer chromatography on a silica gel plate, using *n*-hexane as the solvent. The plates are cleaned up by developing twice with acetone and deactivated for 4 days at 60% R. H. before use. The developed chromatographic plate is marked off into nine zones, 0.5 cm high and 1.5 cm wide. Each zone is scraped off separately and taken up in a specially designed, tapered glass tube; 0.5 ml of acetone is poured over the silica gel. When a rubber bulb is attached to one end of the tube, the acetone can be repeatedly drawn back and forth across the silica gel. The acetone volume is made up to 1 ml. This extract is injected directly onto a gas chromatograph. Recovery values for lindane, heptachlor, aldrin, heptachlor epoxide, *o,p'*-DDE, *p,p'*-DDE, dieldrin, endrin, *o,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-DDT averaged 85-99% when 50-200 ng of pesticides was applied to the TLC plates. The use of standards permits differentiation between polyclorinated biphenyl (PCB) peaks. Tests using this method revealed that PCBs are effectively removed from water by slow sand filtration, activated charcoal treatment, or flocculation.

73-1009. Herzel, F. (Inst. fuer Wasser-, Boden- und Lufthyg., Berlin-Dahlem, Germany). **Polychlorierte Biphenyle und ihre Unterscheidung von Organochlorinsekitziden. [Polychlorinated biphenyls: characteristics and differentiation from organochlorine insecticides.]** *Vom Wasser 38: 71-80; 1971.* (16 references) (German)

Polychlorinated biphenyls (PCBs) are widely distributed environmental contaminants. Their solubility in water varies from several hundred μg to circa 10 mg/l., depending on the manufacturing lot and the water characteristics. They evaporate from surfaces more rapidly than DDT. Column chromatographic and thin-layer chromatographic methods as well as liquid-liquid partitioning have been used for separating PCBs and distinguishing them from organochlorine insecticides. Florisil is inferior to silica gel as a column adsorbent because of the greater variability of the former from batch to batch. If the investigated compounds are eluted from the column with benzene rather than acetonitrile-hexane-ethylene chloride, the benzene solution can be injected directly into a gas chromatograph with an electron capture detector. Silica gel and aluminum oxide-coated thin-layer chromatoplates may be used. PCBs have a relatively high hexane/acetonitrile partition coefficient while that of the DDD (TDE) compounds is relatively low. Only DDE cannot be separated by this method. It cannot be assumed that all unidentifiable gas chromatographic peaks from environmental samples which are not chlorinated insecticides are PCBs.

See also **73-0812** **73-0813**

73-1010. Senetskaya, L. P.; Karabut, N. Ye. (Moscow Mendeleyev Inst. Chem. Technology, Moscow, USSR). **Spektrofotometricheskoye opredeleniye kotorana i dezmetilkotorana. [Spectrophotometric determination of cotoran and desmethylcotoran.]** *Zavod. Lab. 38(7): 793-796; 1972.* (9 references) (Russian)

A spectrophotometric titration method is described for the quantitative determination of cotoran (fluometuron), desmethylcotoran, and mixtures. The sample is dissolved in anhydrous acetic acid and transferred into a 25 ml-cuvette for titration by means of a 0.55 *N* solution of chloric acid in acetic acid. The initial optical density is 0.80. The absorption maxima for cotoran and desmethylcotoran are 282 and 272 nm, respectively. The mixing ratio of cotoran and desmethylcotoran in their mixtures can be determined up to a maximum desmethylcotoran content of 40%. Desmethylcotoran can be determined at sufficient accuracy in a minimum quantity of 0.45 mg with a relative error of ±3%.

Use of funds
for printing this publication
approved by
the Director of the Office of Management and Budget
February 6, 1973

ORDER FORM
FOR HAPAB

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Health Aspects of Pesticides Abstract Bulletin. I am enclosing Money Order ☐ Check ☐ for this subscription.
($11.50 a year; $3.00 additional for foreign mailing.)

Please address the HAPAB as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price $11.50 a year, $3.00 additional for foreign mailing. Price for a single copy of this issue is $1.00, Index issue $2.25.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
Technical Services Division
4770 Buford Hwy., Bld. 29
Chamblee, Georgia 30341

POSTAGE AND FEES PAID
ENVIRONMENTAL
PROTECTION AGENCY
EPA-335

If you do not desire to continue receiving this publication, please CHECK HERE ☐; cut off this label and return it to the above address. Your name will then be removed from the mailing list.